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THESIS

MINIMIZING DRUG RELATED ATTRITION COSTS FOR

INCOMING NAVAL RECRUITS

by

John J. Jacklich

March 1998

Thesis Advisor: Samuel Buttrey

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	March 1998	Master's Thesis

4. TITLE AND SUBTITLE MINIMIZING DRUG RELATED ATTRITION COSTS FOR INCOMING NAVAL RECRUITS

5. FUNDING NUMBERS

6. AUTHOR(S) Jacklich, John, J

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Naval Postgraduate School
Monterey, CA 93943-5000

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Chief of Naval Education and Training, Pensacola, FL

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES
The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited.

12b. DISTRIBUTION CODE

13. ABSTRACT *(maximum 200 words)*.

This thesis investigates alternative strategies for enforcing the Navy's zero-tolerance drug use policy among Navy recruits. Current policy relies mainly on the gas chromatography/mass spectrometry (GC/MS) urinalysis for recruits when they arrive at boot camp. GC/MS, a laboratory test, takes at least three days for confirmation. The cost of separating recruits who fail urinalysis or admit to drug use at boot camp is $2.7 million per year.

Key ideas investigated in the thesis are the administration of drug tests at Military Entrance Processing Stations (MEPS) on the day of shipping to boot camp, and the use of a new "non-instrumented" drug test (NIDT). The NIDT, though not as accurate as GC/MS, requires no laboratory equipment or expertise to administer and furnishes results immediately.

This thesis designs and recommends a new policy, which includes NIDT testing for marijuana at the MEPS in addition to GC/MS at RTC. Through the use of detailed statistical, cost and sensitivity analyses, the thesis concludes that the Navy can save well over a $1 million per year by instituting this policy. These results have been reported to RADM Kevin Green, commander of NTC, Great Lakes, who has announced his intention to adopt the new policy.

14. SUBJECT TERMS	15. NUMBER OF PAGES
Recruit, Drug Testing Policy, RTC Separation Costs	102
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	UL

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-18 298-102

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MINIMIZING DRUG RELATED ATTRITION COSTS FOR INCOMING NAVAL RECRUITS

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B.S. Mechanical Engineering, University of Washington, 1991

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN OPERATIONS RESEARCH

from the

NAVAL POSTGRADUATE SCHOOL

March 1998

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ABSTRACT

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Key ideas investigated in the thesis are the administration of drug tests at Military Entrance Processing Stations (MEPS) on the day of shipping to boot camp, and the use of a new "non-instrumented" drug test (NIDT). The NIDT, though not as accurate as GC/MS, requires no laboratory equipment or expertise to administer and furnishes results immediately.

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THESIS DISCLAIMER

The reader is cautioned that the Microsoft Excel workbook developed for this thesis may not be applicable for all cases of interest. While effort has been made, within the time available, to ensure that the programs are free of computational and logic errors, they cannot be considered validated. Any application of these programs without additional verification is at the risk of the user.

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EXECUTIVE SUMMARY

This thesis will discuss the potential savings which could be realized by changing the current drug testing policy for incoming Navy recruits. Currently no testing is done on the day of shipping at Military Entrance Processing Stations (MEPS). Recruits are tested for drugs upon arrival at Recruit Training Command (RTC) Great Lakes. If a recruit admits to civilian drug use or fails a Gas Chromatography / Mass Spectrometry (GC/MS) drug test he or she is separated from the Navy. This separation is expensive, currently costing an average of $1200 per occurrence.

Pre-screening at MEPS can not be done on the day of shipping because GC/MS urinalysis takes at least three days to complete. A new drug testing technology is currently being utilized by law enforcement agencies. This technology, Non-Instrumented Drug Tests (NIDT), provides a quick on-site testing option. NIDT are qualitative tests which are less accurate than GC/MS; however, they will be useful to the Navy as a pre-screening test for recruits leaving MEPS for boot camp. NIDT failure at MEPS will require an immediate GC/MS confirmation retest. Failure of this retest positively identifies a recruit as a drug user. Drug users can be removed from the Delayed Entry Program (DEP) at MEPS for essentially no cost.

In January 1997, the GAO published a report, entitled "Military Attrition: DOD Could Save Millions by Better Screening Enlisted Personnel," which investigated DOD's enlisted separation policies and attrition costs. The GAO specifically recommended that DOD "direct all the services to test applicants for drugs at the MEPS to prevent the

enlistment of those who now test positive for drugs upon arrival at basic training."

There are many factors which influence prevalence. Drug prevalence is not the same in all cities. There exists a seasonality in drug prevalence, as seen by the Navy. In general, summer has a lower prevalence than the winter. Based on statistical evidence, the forecasted drug prevalence will be similar to that of the past.

This thesis is a combination of a logistic regression model on attrition data, a detailed analysis of current separation costs, user defined NIDT parameters and a Microsoft Excel workbook optimization model, which recommends the minimum cost testing policy. The thesis includes a detailed multi-parameter sensitivity analysis and compares various drug testing policies.

NIDT provide the Navy with the opportunity to immediately reduce its marginal drug-related separation costs by more than $1,000,000 per year. Implementation of this new drug-testing policy could be done quickly and will have little effect on recruit flow to boot camp. Pre-screening recruits for marijuana on the day of shipping will eliminate the largest fraction of drug abusers from the boot camp training pipeline.

I. INTRODUCTION

This thesis analyzes the potential use of non-instrumented drug testing (NIDT) as a drug-user identification and filtering technique. NIDT could be given at Military Entrance Processing Stations (MEPS) to identify drug users from the incoming Navy recruits before they are sworn on active duty. Identifying drug users at MEPS would avoid high separation costs due to urinalysis failure at boot camp. The thesis combines a statistical model that forecasts the numbers of drug users with a cost effectiveness decision model to minimize the Navy's recruit attrition costs.

A. BACKGROUND INFORMATION

1. The Navy's Zero Tolerance Drug Policy

In 1981, the Chief of Naval Operations (CNO) enacted a "Zero Tolerance" drug use policy for all naval personnel. The Navy Drug Screening Laboratory (NDSL) at Naval Training Center (NTC), Great Lakes, Illinois, supports this policy by analyzing collected urine samples. The NDSL's mission is readiness through detection and deterrence. All naval officers and enlisted personnel are subject to random urinalyses. Additionally, all incoming recruits are tested for drugs within 24 hours of arrival at Recruit Training Command (RTC) for boot camp training. Sailors who fail a urinalysis test are separated from the Navy.

2. Recruit Inprocessing

Potential recruits are processed for RTC at a MEPS close to their home town. Individuals visit the MEPS twice. On the first day, the MEPS performs medical exams and assigns specific jobs to the individuals. Individuals are entered into the Delayed Entry Program (DEP) at the end of their first visit. An individual may remain in DEP, essentially a non-binding contract between the individual and the Navy, for up to a year. In May 1997, the MEPS began collecting urine samples to be analyzed for drugs by NDSL for drugs between the time of DEP entry and boot camp shipping date.

Individuals remain in DEP until their scheduled boot camp shipping date, at which time they return to the MEPS for a brief medical exam. The individual is sworn on active duty and transported to RTC Great Lakes. While in the DEP, an enlistment contract can be canceled at the MEPS for essentially no cost. Once the individuals are on active duty, they can only be separated from RTC. This separation costs the Navy an average of $1200 per enlistee.

3. NIDT and GC/MS

NIDT, a new technology, provides a means to qualitatively determine if illicit drug metabolites are in a potential sailor's urine. NIDT tests for illicit drugs on site and gives a supervisor an immediate indication of drug use. Much like home pregnancy tests, NIDT provides the tester with quick and accurate qualitative results. Failure of a NIDT indicates a high probability of Gas Chromatography / Mass Spectrometry (GC/MS)

urinalysis failure at RTC. Although the cost of NIDT is competitive with that of GC/MS, NIDT is not an adequate substitute for GC/MS. Potential problems include inaccuracy, cross-reactivity and a lack of urine metabolite quantification.

The Navy's current technology, GC/MS, gives both a qualitative and quantitative measure of drug use. Because GC/MS analysis requires extensive lab work which takes at least three days to complete, it cannot not be used on the day of shipping. Therefore, it is done upon arrival at RTC. While not as effective as GC/MS, NIDT can be used to predict success or failure of a potential recruit's initial urinalysis at RTC. Potential sailors could be given an NIDT at MEPS immediately prior to shipping. Individuals who pass the NIDT should be sworn onto active duty as before. Failure of a NIDT is an indication of drug use. Another urine sample should immediately be taken from those who fail the NIDT, and these individuals should remain in their Delayed Entry Program, DEP, until a GC/MS analysis can be performed.

4. Separation Costs

In January 1997, the GAO published a report [Ref 1] on boot camp attrition which was highly critical of DOD and the Navy. This report suggested that 1994 out-processing costs per recruit who failed an initial urinalysis were as high as $4900. Marginal actual costs to the public currently vary between $900 and $1500 per recruit. The analysis in this thesis shows the costs for a nine-day stay at RTC as listed in Table 1.

Transportation	
Median airfare from MEPS to RTC	$140
Travel admin (SATO)	$15
Median bus fare from RTC to MEPS	$93
Pay, feed and housing costs	
Pay (based on an E1 salary of $28 per day)	$252
Galley meals (based on $7 per day)	$63
Segregated berthing (average cost*)	$25
Goods and services received	
Initial uniform issue	$431
Initial clothing maintenance allowance	$113 for males, $328 for females
Ditty bag (paid for by the recruit)	$391 for males, $436 for females
Medical	$47 for males, $82 for females
Dental X-rays	$18
Legal Processing	$56
24 hour supervision (average cost*)	$238
Actual marginal costs vary by city from	**$900 to $1500**

*Total cost / the 1825 recruits separated in FY1996

Table 1 Current Separation Costs Based on a Nine Day Stay at RTC

5. NIDT Effectiveness

It is difficult to estimate the Navy's potential benefit from NIDT without a pilot program. Based on information available from test kit manufacturers and an independent

study conducted for the U.S. Courts [Ref 2], NIDT is likely to be more than 80% percent effective at pre-screening.

DOD has not done an analysis on NIDT effectiveness and, in fact, rejected a request for such an analysis because these test kits have a higher false negative rate than the pre-screening process currently used. The purpose of this thesis is not to suggest that pre-screening at RTC be replaced by NIDT pre-screening at MEPS. It is important that every recruit be tested for all drugs upon arriving at RTC. Separation costs are as low as $900 per recruit because accurate quantitative screening at RTC is conducted on the day of arrival. If identification of the drug user was delayed additional costs would be incurred prior to separation.

At this time, it is still unclear how well NIDT works, although the kit manufacturers suggest they are more than 95-percent effective. [Ref 3]. A report produced this year for the U.S. Federal Courts by Duo Research of Denver, Colorado suggests that the kits may have a false negative rate as high as 20% percent [Ref 2]. Unfortunately, the sample used by each of these studies is not representative of the recruit population arriving at RTC.

6. Moment of Truth

When recruits arrive at RTC, they are given a GC/MS urinalysis test. Then their civilian clothing is taken, and they are given a haircut. Next, the recruits are given a final opportunity to admit potential problems with the service record prepared by their

recruiter and MEPS. Recruits are specifically asked if they used drugs prior to boot camp. This final opportunity is known as the "Moment of Truth."

Statistical analysis of the data indicates that urinalysis failures vary by season, drug, and point of entry. The best NIDT policy is not simply to test for all drugs at all MEPS, because the cost of testing for all drugs would be more than the expected benefit. Also, even if NIDT is as accurate as GC/MS, recruits will continue to be separated from RTC for drugs. These separations are likely because the "Moment of Truth" is very effective.

An analysis of the data from the PRIDE database for FY96 indicates that current drug-related separation costs are less than $2,700,000 per year. It will not be possible to decrease this cost without a change in the Navy's zero-tolerance drug policy. Not all recruits separated for drugs at RTC fail their initial urinalysis. My estimated lower bound cost, based on 1996 data, is $500,000 per year due to "Moment of Truth" disclosures at RTC. Thus, there are potential savings of $2,200,000 per year, savings that could be realized by pre-screening potential recruits on the day of shipping at MEPS.

B. CURRENT POLICY

According to the Navy's zero-tolerance drug policy, MEPS can give a drug waiver for prior marijuana use, but not for hard drugs like cocaine. Prior hard drug use disqualifies the potential recruit for service. Recruits are told that they will be given a

drug test upon arrival at Great Lakes and that the GC/MS urinalysis is highly accurate and will show any drug use within 30 days. The recruits also know the date of the drug test since they know when they will report to RTC. A small fraction of recruits fail this initial test and are separated from the Navy within ten days of arrival.

The majority of recruits fly to Chicago from their local MEPS. Within 24 hours of arriving at RTC, recruits are required to provide a urine sample, which is transported to the NDSL for analysis. If drug confirmation is required, NDSL performs a GC/MS analysis, the most accurate available. Unfortunately, the analysis requires expensive equipment, highly-trained personnel and at least three days to get the confirmed results of failure. Due to this three-day lag, testing is not performed at the MEPS on the day of shipping.

After the recruits give their urine samples, they continue their training. Recruits are paid a salary during training, and in addition, they are given an initial clothing allowance, as well as a loan for purchasing a "ditty bag" full of supplies. The recruits are also given medical and dental exams. They are also given an opportunity to admit to drug use after the sample is taken and prior to the analysis results. Even those who pass the GC/MS drug analysis are separated if they admit use during the "moment of truth."

When the list of urinalysis failures is announced, the identified recruits are removed from training and processed for separation. They are moved to a separate barracks and supervised by a staff of Navy personnel. The drug failures are sent to RTC's legal department for out-processing and are given a bus ticket home. The

separation process takes an average of six days. The average length of enlistment for a recruit failing the initial urinalysis is nine days.

C. ANALYSIS GOALS

This thesis combines data analysis, policy analysis, cost analysis, sensitivity analysis, optimization and common sense to produce the Navy's most economical drug testing policy. While the author understands that there are other measures of effectiveness which could be used, only those costs which can be directly measured are used in this analysis. The criterion used to decide on the best policy is money.

A statistical model was developed to predict the number of drug failures expected for each city and month. Data from the PRIDE database reports the MEPS from which the recruit entered the Navy, the GC/MS urinalysis result, and the month separated. The total number of accessions from each MEPS for each month is also reported. Drug attrition rate varies from zero to 50 percent for a given month at a given MEPS. The overall average attrition rate is five percent for all drugs including the "moment of truth."

The decision model was formulated as a Microsoft Excel workbook. Once a prediction of the number of accessions and drug users is obtained, the statistical model output can be used as an input to the decision model. The model solves for the cheapest of three alternatives. One decision is to do no testing. This would be chosen if the cost of NIDT exceeded the expected benefit of avoiding boot camp attrition costs. A second decision is to test only for marijuana or THC. A third choice is to use a more expensive

test and test for THC, methamphetamine and cocaine. The model allows the user to vary the kit price and effectiveness of the NIDT. The cost-effectiveness model output is an optimal testing plan for each MEPS for each month. The Excel model is easy to use and allows the user to ask "what if" questions. Optimal testing programs can be instantly compared to non-optimal ones. Solution time is less than five seconds.

The purpose of the decision model is to minimize total separation and testing costs by selectively testing on the day of shipping at each MEPS. The model minimizes total cost while considering separation costs, test kit costs, test kit false negative rate, retest costs and test kit false positive rates. The model also predicts the number of personnel who will be lost from DEP at each MEPS for each time period of interest. This DEP attrition would not be felt by RTC, but it is of interest to the Chief of Naval Recruiting (CNRC).

D. DECISION MODEL LIMITATIONS

The decision model is very sensitive to the ratio of expected drug users to accessions. If a large percentage of drug users is expected, the model will minimize cost by recommending testing. If no drug users are expected in a given month for a given MEPS, then no testing will be recommended. The model is formulated in Microsoft Excel; therefore, the algorithm is hidden from the user. If new constraints are determined or if new options desired, they could not be easily implemented.

The model assumes that there will continue to be "moment of truth" drug disclosures. This attrition can not be avoided by NIDT. Some drugs have a short biological half life; therefore, testing the day before arrival at RTC may result in more confirmed failures than if testing were delayed. The MEPS confirmation rate could actually be higher than that at RTC's because there would be a higher concentration of drug metabolite in the recruits' urine at MEPS.

Non-instrumented drug tests have demonstrated high reliability. The model will solve for the most cost-effective policy regardless of NIDT false positive and false negative probabilities; however, if the NIDT kit used is extremely inaccurate, this policy may not be the best one. High false positive rates are the primary concern. If large numbers of recruits are turned away from MEPS on their day of shipping to RTC many may choose civilian life over the Navy. These individuals may not come back; therefore, recruiting would suffer. Similarly, if large numbers of drug-using recruits pass the NIDT, the deterrent value of the Navy's GC/MS drug testing policy could be undermined. These issues are not modeled.

E. OVERVIEW OF THESIS

Chapter II discusses current drug testing technology. Chapter III discusses data analysis. Chapter IV discusses the current costs of drug attrition at RTC. Chapter V discusses the decision model's formulation and sensitivity analysis. Chapter VI is a thesis summary.

II. DRUG TESTING

This chapter discusses the various drug testing technologies in use today. It also proposes the use of additional testing to maximize the Navy's drug testing policy effectiveness. The Navy currently uses the competitive-binding radioimmunoassay (RIA) procedure for pre-screening and gas chromatography/mass spectrometry (GC/MS) for confirmation. A new technology, non-instrumented drug testing (NIDT), uses RIA technology in a kit form. NIDT is currently being used by various law-enforcement agencies.

The Navy Drug Screening Lab (NDSL) in Great Lakes is responsible for recruit urinalyses. Initial urinalysis of recruits at RTC specifically tests for THC, cocaine, amphetamine, methamphetamine and LSD. After boot camp, all military members are subject to random urinalyses, which tests for the five drugs tested at boot camp. Additionally, these random urinalyses test for opiates and phencyclidine (PCP).

A. TECHNOLOGY IN USE TODAY

1. Summary Of Drugs

The Navy currently does recruit screening and confirmation urinalysis testing on five drugs. Tetrahydrocannabinol, or THC, is the active ingredient in marijuana. THC urinary metabolites are present and normally detectable between three and ten days after ingestion. The concentration of metabolites depends on both the total amount and the

frequency of use. Metabolites can be confirmed in chronic users up to 30 days. Cocaine is a stimulant and anesthetic, which, with a biological half-life of about eight hours, is eliminated more quickly than THC. Cocaine metabolites can be confirmed up to three days after exposure. Amphetamine and methamphetamine are stimulants which can be confirmed by urinalysis for three to five days. Finally, LSD is a hallucinogenic drug which is rapidly removed from the body. LSD is normally undetectable within a day of ingestion.

2. Drug Cut-off Levels

NDSL performs a series of tests. The first and second tests are qualitative. If urine metabolites exceed the cut-off level, then a failure is recorded. The failure cut-off levels are shown in the Table 2 below.

Drug	Screening Cut-off Level	Confirmation Cut-off Level
THC	50 ng/ml	15 ng/mg
Cocaine	150 ng/ml	100 ng/ml
Amphetamine & Methamphetamine	500 ng/ml	500 ng/ml
LSD	500 pg/ml	200 pg/ml

Table 2 Metabolite Cut-off Levels by Drug

3. The NDSL's Current Drug Screening Process

The NDSL currently uses immunoassay (IA) technology for screening and gas chromatography / mass spectrometry (GC/MS) for confirmation. In NDSL's Olympus IA instrument, a batch of several hundred urine samples is tested simultaneously. A fraction of the batch will have urine metabolites higher than the cut-off level and fail the IA test. These samples are collected into a smaller batch and analyzed again by the Olympus. Only those samples that fail a second time are analyzed by GC/MS for confirmation. GC/MS urinalysis both identifies and quantifies the drug used by the sailor. GC/MS results are admissible at court-martial and are the basis for separation from the Navy.

Specific data from NDSL were not available. However, it is well-known that the most frequent drug confirmed was THC. Cocaine is a distant second, followed by amphetamine and methamphetamine. LSD use is rarely confirmed due to both a low popularity and an extremely short biological half-life. The Navy's confirmation rate of random urinalysis for all personnel following RTC has averaged at about one percent for several years, whereas the confirmation rate for inductees averages between three and five percent.

B. NON-INSTRUMENTED DRUG TESTING TECHNOLOGY (NIDT)

Non-instrumented Drug Testing (NIDT) is a commercial-off-the-shelf (COTS) technology that employs a one-step solid-phase immunoassay (SPIA) to qualitatively

test for drugs above the cut-off level. Similar in construction to a home pregnancy test, NIDT does not require instrumentation or extensive operator training. The method gives the supervisor instant qualitative results for each of the drugs tested for at RTC, except LSD. NIDT is used extensively in the corporate world and by some law-enforcement agencies.

NIDT kits, which are available to test for specific drugs or several drugs, currently are produced by over a dozen manufacturers. Although the kit prices vary, they are competitive with NDSL's marginal screening costs. This thesis uses a baseline cost of $5 for a kit that tests for THC and $20 for a kit that tests for THC, cocaine and amphetamines. It is likely that costs will go down in the future as the technology improves and demand increases. If the Navy or other services adopt NIDT, that would probabaly accelerate the lowering of the kit cost.

NDSL and DOD do not use NIDT for screening because NIDT's uses SPIA technology, which has a higher false negative rate than the IA technology used by NDSL. If NIDT were used by NDSL for pre-screening, a larger proportion of urine samples would avoid confirmation testing by GC/MS and, effectively, more people would beat the Navy's drug tests. NIDT can indicate that a specific drug was above the cut-off level, but can not determine how much drug metabolite was in the specimen. NIDT results, therefore, could not be used in court-martial or as grounds for separation.

It is known that NIDT works well with urine specimens that are strongly negative, no metabolites, or strongly positive, significant metabolites [Ref 2]. The exact

false positive and false negative rates are unknown. The manufacturer's packet inserts quote false positive rates and false negative rates as low as one or two percent [Ref 3]. A report prepared for Administrative Office of the U.S. Courts [Ref 2] shows that NIDT effectiveness varies. This report shows that spiked urine samples near the cut-off may have false positive and false negative rates as high as twenty percent.

Because NIDT is marginally more expensive than the Olympus IA process, DOD has not done an effectiveness study on NIDT. Also, NIDT's false negative rate is likely to be higher than IA's. Another disadvantage is that the cut-off level for the NIDT's is set to those of the Department of Health and Human Services (HHS) cut-offs and not those of the military. The HHS cut-off levels are listed in Table 3 below.

Drug	HHS Screening Cut-off Level
THC	50 ng/ml
Cocaine	300 ng/ml
Amphetamine & Methamphetamine	1000 ng/ml

Table 3 HHS Cut-off Levels

C. USING NIDT AS A FILTER PRIOR TO BOOT CAMP

1. Drug Testing at MEPS

All U.S. armed forces recruits enter the military through a Military Entrance Processing Station or MEPS. There are currently 63 MEPS throughout the country.

The MEPS administered urinalyses of all Navy inductees between June 1988 and January 1989. This drug testing involves obtaining a urine sample, shipping it to a centrally located lab and waiting at least three days for results. An analysis [Ref 4] of the effectiveness of this policy from the late eighties reached several interesting conclusions.

First, the level of drug abuse found in recruits was strongly correlated to the levels of abuse found in high school seniors. An individual entering the military was no more or less likely to be a drug user than was the average high school graduate. Second, the study showed that MEPS testing was responsible for reducing the number of drug users entering the Navy.

The Navy expected, and still expects, DEP entry GC/MS testing at MEPS to significantly lower the drug attrition rate at RTC. The study [Ref 4] found that testing at DEP entry has little effect on drug attrition at RTC. Individuals screened by MEPS have about the same failure rate at RTC as would the average high school senior. This is because the individual has an opportunity to use drugs for at least one month between entering DEP and reporting to RTC. What was really needed was a way of determining drug users immediately prior to boot camp shipping.

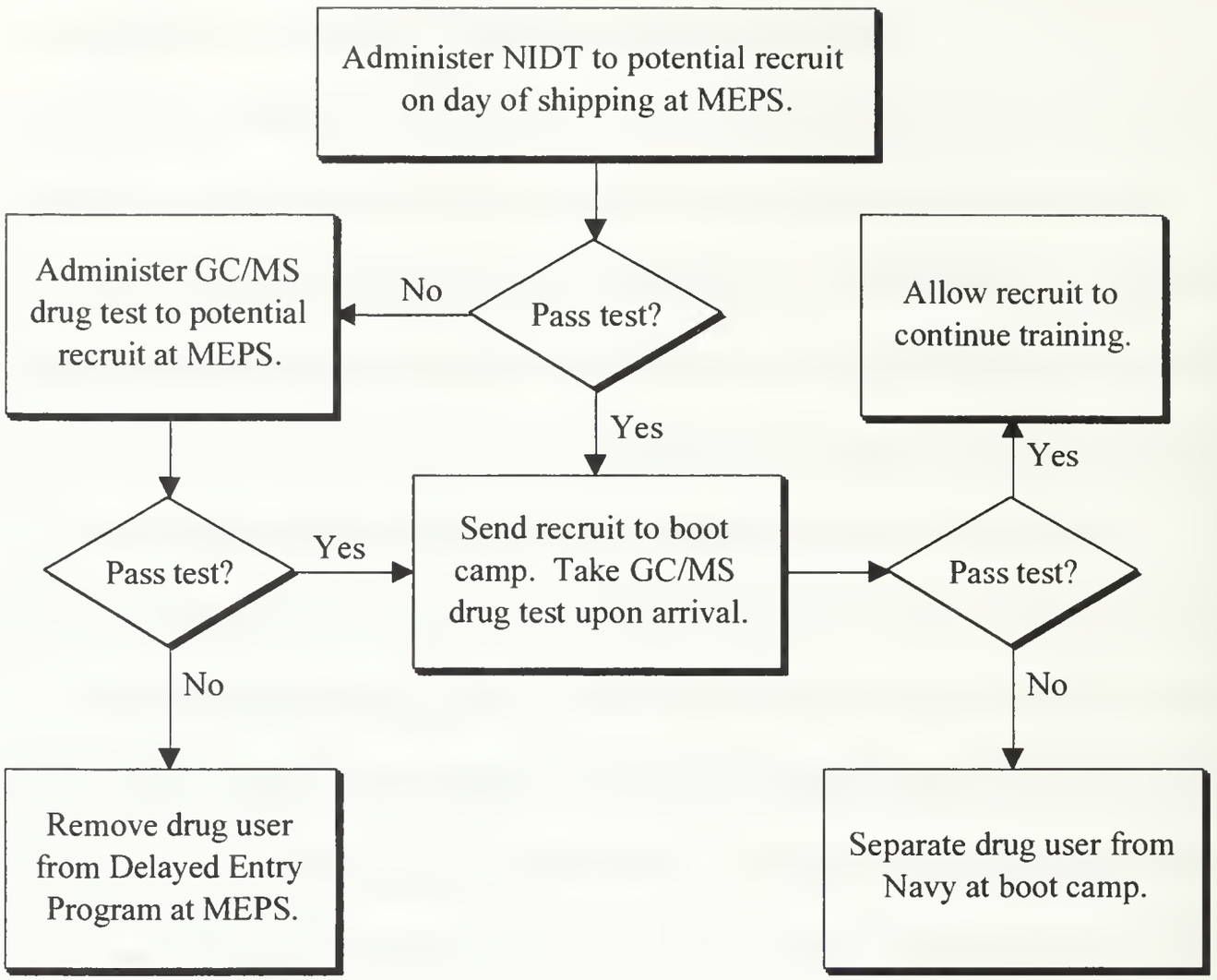
2. How to Use NIDT as a Filter to Minimize RTC Attrition Costs

It has already been stated that NIDT is inadequate for pre-screening at RTC; however, it could be used to identify drug users immediately prior to shipping. Testing would be beneficial if the expected number of drug users passing through a given MEPS

and the marginal separation costs were both high. In this case, the benefit of testing 24 hours prior to arrival at RTC would outweigh the additional cost of testing. The value of the NIDT information also depends on the price and accuracy of the kits.

If an individual fails a drug test at MEPS, his or her contract is invalidated for essentially no cost. However, if the individual is sworn onto active duty at MEPS and then fails the drug test at RTC, the Navy must administratively separate the individual at RTC Great lakes. This separation is expensive.

The decision model solves for the best mixed strategy. It proposes that the Navy use NIDT at MEPS where and when the separation costs and drug prevalence are the highest. If the Navy decides that it is cost-effective to test at a particular MEPS, (see Figure 1), then all potential recruits processed at that MEPS would be given a NIDT prior to receiving a plane ticket to RTC. The individuals who pass the NIDT are sworn onto active duty as before. Of course, they would be given a GC/MS urinalysis upon arrival at RTC, regardless of their point of origin. Individuals who fail the NIDT should not be sworn on active duty until the result can be confirmed. The individual failing the NIDT should be required to give a second urine sample and then be sent home. This second urine sample should be analyzed by IA and confirmed by GC/MS. If the sample is confirmed positive, the MEPS should separate the individual. If the sample is confirmed negative, the individual should be immediately returned to the MEPS and sworn onto active duty.


Administer NIDT to potential recruit on day of shipping at MEPS.
Pass test?
No
Administer GC/MS drug test to potential recruit at MEPS.
Yes
Allow recruit to continue training.
Yes
Pass test?
Yes
Send recruit to boot camp. Take GC/MS drug test upon arrival.
Pass test?
No
No
Remove drug user from Delayed Entry Program at MEPS.
Separate drug user from Navy at boot camp.

GC/MS: Gas Chromatography / Mass Spectrometry
MEPS: Military Entrance Processing Station
NIDT: Non-Instrumented Drug Test

Figure 1 Proposed Drug Testing Plan Flow Chart

Administering NIDT at MEPS has the following advantages over the Navy's current MEPS drug testing policy. First, the window of opportunity for drug use after testing at MEPS is essentially eliminated. Secondly, since testing only occurs only for specific drugs at specific MEPS, over-testing is eliminated, and testing costs are

minimized. Finally, NIDT on the day of shipping is more likely than GC/MS testing on the day of DEP entry to lower the total number of drug failures seen at RTC.

III. DATA ANALYSIS

This chapter discusses the analysis of data from the Navy's PRIDE database. Attrition data were used in the construction of a logistic regression statistical model that forecasts the monthly expected drug failure rates at each MEPS. The predicted drug failure rates are inputs to the decision model which determines the optimal drug testing policy for each MEPS.

A. ATTRITION DATA

Accession and attrition data were collected for each of the 63 MEPS. Data for each MEPS included the monthly totals of recruits arriving at RTC, the number of recruits separated due to initial positive urinalysis, and the number of recruits separated due to "moment of truth" disclosures at RTC. The monthly attrition data for each MEPS were further broken down into two categories, cannabis and non-cannabis. Non-cannabis was assumed to be either cocaine or methamphetamine use. A recruit failing for both cannabis (THC) and cocaine or methamphetamine is recorded as a non-cannabis separation.

1. The "PRIDE" Data Base

Each individual recruited is entered into the Navy's PRIDE database. In March of 1995, the Navy began recording the specific MEPS at which the recruit was processed, prior to shipment to RTC. If an individual is separated from the Navy, a separation code

is entered. The number of accessions and drug separations were sorted according to MEPS and month. Cohort data were collected for all recruits processed at RTC from March 1995 to July 1997.

2. MEPS Accessions

The Department of Defense currently operates 63 MEPS. In fiscal year 1996, (FY96), nearly 48,000 recruits were processed at RTC Great Lakes. The accession data can be found in Appendix A.

3. THC Attrition

Cohort data for cannabis attrition can be found in Appendix B. Since the majority of recruits separated for drugs leave RTC within ten days of arrival, the assumption is made that recruits are separated in the same month they arrive.

4. Cocaine and Methamphetamine Attrition

THC is the most likely cause of a drug-related separation at RTC; however, a small fraction of recruits are separated for cocaine or methamphetamine. There is no drug separation code which specifies the non-cannabis drug. Cohort data for non-cannabis attrition can be found in Appendix C.

5. "Moment of Truth" Attrition

Many recruits are separated for drugs without a urinalysis failure. Admission of civilian "hard-drug" use, not marijuana, is grounds for separation. These admissions

usually occur during the "moment of truth" interview, which takes place on the first day of training at RTC. There were 415 "moment of truth" drug-related separations in FY96. Since these failures were not determined by NIDT or GC/MS, it seems clear that even 100-percent accurate MEPS drug testing will not eliminate drug-related separations at RTC. This thesis assumes that there will be about the same number of these separations in the future and that these separations are a fixed cost at RTC.

B. THE REGRESSION MODEL

A statistical regression model is needed to predict the probability of drug failure for both THC and cocaine/methamphetamine. Standard multivariate regression is inadequate due to the categorical nature of the drug test outcome. Multivariate logistic regression was chosen as a more appropriate statistical tool [Ref 5].

Let p be the probability of failing a drug test. Let X_k be one if condition k is true and zero otherwise. According to the multivariate logistic regression model $p = 1/(1+e^{L})$, where "L" is the estimated logit. The estimated logit coefficients are the $\hat{ß}_k$'s.

$$L = \hat{ß}_0 + \sum_{k=1}^{K-1} \hat{ß}_k X_k$$

Statistical software can be used to quickly solve for the $\hat{ß}_k$'s. A forecast of future drug failure rates can be found for any combination of X_k's.

1. Discussion of Factors

There are many factors which affect the probability of a potential recruit failing a GC/MS drug test. The goal of this thesis is to minimize drug-related attrition costs by using NIDT as a pre-screening tool. Because the basic decision is whether or not to test, the implicit factors are where and when to test.

This analysis assumes that there was a MEPS and a month factor. It is well known that not all cities have the same expected drug prevalence rates. In addition, the time of year is also a factor. The summer months are the busiest at RTC because the majority of high school seniors arrive at RTC shortly after graduation. Summer also has the lowest drug prevalence rate.

The final factor affecting the confirmed drug prevalence rate, see Appendix D, is the pre-screening technique used by the Navy Drug Screening Lab, NDSL. If a sample passes screening at NDSL, it will not be analyzed by GC/MS. Prior to October 1995, the NDSL used the "RIA test" for THC pre-screening. Between October 1995 and September 1996, the NDSL used the "IA test" for THC pre-screening. NDSL later replaced the IA test because the test had a higher false negative rate than the RIA test. Since October 1996, the NDSL has used an improved IA test.

2. S-plus Model

Exploratory data analysis was performed on the PRIDE data using the software application S-plus [Ref 6]. The logistic regression model was fit with 28 months of THC

and cocaine/methamphetamine data. Initially, "year" was used as a factor in fitting the data., but was subsequently dropped in both the THC and the cocaine/methamphetamine logistic models because it did not improve fit. This means that 1995 was statistically no different from 1996 or 1997, a fact that improves the power of future forecasts.

3. Results

The initial S-plus logistic model for the THC data is shown below.

```
> drug.glm.all_glm(as.matrix(drug.df[,4:5])~MEPS+Month+Test+Year,
data=drug.df,family=binomial,na.action=na.omit)
```

The call for an analysis of deviance table and the subsequent ANOVA table are listed below.

```
> drug.anova.all_anova(drug.glm.all,test="Chi")
> drug.anova.all
Analysis of Deviance Table Binomial model
Response: as.matrix(drug.df[, 4:5])
Terms added sequentially (first to last)
      Df Deviance  Resid.Df  Resid.Dev Pr(Chi)
 NULL                 1826   2272.874
 MEPS 65 207.7012      1761   2065.173 0.0000000
Month 11 153.3807      1750   1911.792 0.0000000
 Test  2  88.7189      1748   1823.073 0.0000000
 Year  1   0.9105      1747   1822.163 0.3399895
```

It is clear that the factor "year" does not improve the fit of the model and can be dropped.

```
> drug.anova.NoYear_anova(drug.glm.NoYear,test="Chi")
> drug.anova.NoYear
Analysis of Deviance Table
Binomial model
Response: as.matrix(drug.df[, 4:5])
```

```
Terms added sequentially (first to last)
      Df Deviance  Resid.Df  Resid.Dev Pr(Chi)
 NULL                 1826   2272.874
 MEPS 65 207.7012      1761   2065.173 1.110223e-016
Month 11 153.3807      1750   1911.792 0.000000e+000
 Test  2  88.7189      1748   1823.073 0.000000e+000
```

Now all the factors in the model are significant. Dropping the factor "Year" had little effect on the model's fit. This is shown below by comparing the two models. The fitted coefficients are found in Appendix D. The forecasted THC prevalence for each MEPS is listed in Appendix E.

```
> drug.anova.all.NoYear_anova(drug.glm.all,drug.glm.NoYear)
> drug.anova.all.NoYear
Analysis of Deviance Table Response: as.matrix(drug.df[, 4:5])
                      Terms  Resid.Df Resid. Dev  Test Df  Deviance
1 MEPS + Month + Test + Year      1747   1822.163
2        MEPS + Month + Test      1748   1823.073 -Year -1 -0.910471
```

The analysis for the cocaine/methamphetamine data was done similarly to that of the THC data. The initial S-plus logistic model for this data is shown below.

```
> cocaine.glm.all_glm(as.matrix(cocaine.df[,4:5])~Month+Year+MEPS,
data=cocaine.df,family=binomial,na.action=na.omit)
```

The call for an analysis of deviance table and the subsequent ANOVA table are listed below.

```
> cocaine.anova.all_anova(cocaine.glm.all,test="Chi")
> cocaine.anova.all
Analysis of Deviance Table
Binomial model
Response: as.matrix(cocaine.df[, 4:5])
Terms added sequentially (first to last)
```

```
      Df Deviance  Resid.Df  Resid.Dev Pr(Chi)
 NULL                 1826   1433.022
Month 14  65.0945      1812   1367.927 0.0000000
 Year  2   0.4031      1810   1367.524 0.8174761
 MEPS 62 149.5967      1748   1217.928 0.0000000
```

Again, it is clear that the factor "year" does not improve the fit of the model and can be dropped.

```
> cocaine.glm.NoYear_glm(as.matrix(cocaine.df[,4:5])~Month+MEPS,
data=cocaine.df,family=binomial,na.action=na.omit)
> cocaine.anova.NoYear_anova(cocaine.glm.NoYear,test="Chi")
> cocaine.anova.NoYear
Analysis of Deviance Table
Binomial model
Response: as.matrix(cocaine.df[, 4:5])
Terms added sequentially (first to last)
      Df Deviance  Resid.Df  Resid.Dev Pr(Chi)
 NULL                 1826   1433.022
Month 14  65.0945      1812   1367.927 1.471542e-008
 MEPS 62 149.8023      1750   1218.125 3.148270e-009
```

Now all the factors in the model are significant. Dropping the factor "year" had little effect on the model's fit. The fitted coefficients are found in Appendix F. The forecasted cocaine/methamphetamine prevalence for each MEPS is listed in Appendix G.

4. Statistical Logistic Model Results and Conclusions

There are many factors that influence drug prevalence. It is not the same in all cities. There exists a seasonality in drug prevalence, as seen by the Navy. In general, summer has a lower prevalence than winter. There is no evidence of a difference between 1996 and 1997; therefore, there is no reason to believe that future years will be different

from the recent past. However, because only two years of data were analyzed, this conclusion must be regarded as preliminary.

In both of these logistic regressions, the residual deviance from the final model is comparable in size to the number of degrees of freedom. The residual deviance compares the fit of these models to their saturated counterparts and can be expected to asymptotically follow the chi-squared distribution. Because the magnitude of the deviance is similar to the degrees of freedom there is evidence that these regressions are fitting reasonably well.

A graphical examination of the results of the two regressions showed no obvious problems. The deviance residuals in the THC case were well-scattered; in the cocaine case the large number of zeros makes interpretation difficult. Cook's distances showed no evidence of undue influence from high-leverage points and partial residual plots gave no reason to suspect the assumptions of linearity.

IV. COST ANALYSIS

This Chapter will discuss the current marginal and fixed drug attrition costs from RTC. In January 1997, the United States General Accounting Office (GAO) published a report on boot camp attrition which was highly critical of DOD and the Navy. This report suggested that 1994 out-processing costs per recruit who failed an initial urinalysis were as high as $4900. Actual costs to the public currently vary between $900 and $1500 per recruit. The report also criticized the Navy for not doing drug testing at MEPS. The Navy began testing all inductees for drugs prior to acceptance into DEP, a change in policy, in May 1997.

A. DISCUSSION OF GAO REPORT GAO/NSIAD-97-39

In January 1997, the GAO published GAO/NSIAD-97-39 [Ref 1]. This report, entitled "Military Attrition: DOD Could Save Millions by Better Screening Enlisted Personnel," investigated DOD's enlisted separation policies and attrition costs. The GAO did a three-day audit at RTC.

The Navy told the GAO that separation costs for personnel failing initial urinalysis were $4700 for each male and $4900 for each female. At that time, the Navy estimated that it cost $83 to transport a recruit to RTC, as well as $3650 to pay, feed and house a recruit for the 25 days required for out-processing. A total of $91 were spent on medical care and $817 on for uniforms while at RTC. Finally, $83 were spent sending the individual to his or her home of record.

In 1994, there were 1669 drug separations from RTC [Ref 1]. With a marginal separation cost of $4700 per person, the GAO estimated the Navy could have saved $7.8 million by pre-screening at MEPS. The GAO specifically recommended that DOD "direct all the services to test applicants for drugs at the MEPS to prevent the enlistment of those who now test positive for drugs upon arrival at basic training."

The DOD partially concurred with the GAO recommendation, but stated, "It has not been proven that testing at MEPS only, prior to entering the DEP, is an accurate indicator that recruits will arrive at training centers drug free." The DOD stated that a detailed cost benefit analysis should be performed because the cost of separations from boot camp may be less than the cost of testing at MEPS and RTC.

B. EXPERIENCE-TOUR FINDINGS

As part of the master's degree requirements, the author spent five weeks at NTC Great Lakes., as well as several days at NDSL and at RTC investigating current drug attrition costs. Based on this experience, the author estimates of marginal attrition costs at, $900 to $1500, was significantly less than the GAO's estimate of $4700 per recruit. In fact, RTC estimates the average cost to produce a graduate at $5,235 [Ref 7].

C. COST SUMMARY

1. Transportation

All recruits fly into Chicago's O'Hare airport, except those processed at the Chicago MEPS. The government-contract airfares from each of the 63 MEPS to O'Hare varies., with the mean airfare per recruit at $212.50. The airport tax is $3 and the charter bus fare to RTC is $15.50. Thus, average transportation costs to RTC are $231.

If recruits are identified for separation, bus transportation to their home of record is arranged. Travel processing fees are $15 per recruit, and the median bus fare per recruit is $93. This assumes that the recruit home of record was the MEPS at which the recruit was processed.

2. Pay and Galley Services

Also calculated was the mean length of stay for a recruit being separated for drugs. There were 448 individuals separated between 2 January and 22 May 1997. The mean length of stay was nine days, and the median length of stay was eight days. The minimum stay was six days, and the maximum stay was 79 days. The assumption was that the typical recruit was an E1 who makes $28 per day. All recruits eat at the RTC galley; the galley estimates their cost to feed a recruit at $7 per day. Assuming an average stay of nine days, the total cost for pay and feeding a recruit separated for drugs is $315.

3. Uniforms and Ditty Bag

All recruits are authorized an initial clothing maintenance allowance. This money is to cover tailoring and alteration of uniforms while at RTC. The cost for male recruits is $112.82 and, for females, $328.

An initial issue of Navy dungarees and boots costs $431.10. The recruits also receive a ditty bag containing personal hygiene supplies and $150 to $200 worth of cash vouchers for use at the Navy Exchange. The ditty bag is an advance, not an allowance; the recruit pays for it out of his or her basic pay. The cost is $391.08 for males and $436.08 for females. Assuming a nine-day stay at $28 per day, recruits will pay off $252 of the ditty bag advance. The average male is billed for the additional $139.08, females for the additional $189.08. Since it is extremely unlikely that a recruit separated for drugs will receive a paycheck, one can assume that a disgruntled former recruit would be unlikely to pay his or her bill. This loss could be eliminated simply by giving the recruit a $20 Navy Exchange cash voucher the first week and the remaining $130 to $180 the second week of training. Given the baseline assumption that of 50,000 recruits processed this year, 2000 will be separated for drug use, the immediate marginal savings of renegotiating the Navy Exchange contract would be at least $260,000.

4. Medical and Dental

All recruits receive some medical and dental care prior to being identified for separation. Marginal medical costs, which include both medical personnel's salary and

chemical reagents, are $46.85 for males and $81.86 for females [Appendix H]. Similarly, marginal costs for dental staff and X-rays are $18 [Appendix H]. The marginal cost of urinalysis by Navy Drug Screening Laboratory, NDSL is unavailable. The accepted contracted bid for MEPS testing, THC and cocaine testing only, is $6.67 for screening and $35 for confirmation. NDSL's costs are most likely similar.

5. Berthing

Recruits identified for separation are segregated in their own barracks. "Seps Division" is a barracks which has with a capacity of 80 recruits. The building must be heated and maintained, regardless of the number of recruits assigned. In 1996, annual maintenance costs were $44,979. This is a fixed cost; however, 1825 recruits stayed in Seps Division in FY96. The average cost was $25 per recruit.

6. Supervision

A staff of ten is assigned to supervise Seps Division. The staff's salary equivalent [Appendix H] is $434,501. This is a fixed cost; however, the average cost for 1,825 recruits is $238 per recruit.

7. Legal Separation Costs

A staff of eight works at RTC legal. These staff members spend one-third [Appendix H] of their time out-processing recruits. This fraction of the staff's salary equivalent is $99,921. The RTC legal department's 1997 operational budget was

$23,000. RTC legal estimates that one-ninth of this operational budget, $2,556, was used for drug separation out-processing. The marginal legal costs based on 1,825 recruits total $56.

D. FIXED AND MARGINAL COSTS

1. Discussion of "Moment of Truth" Attrition

All recruits take a drug test the night they arrive at RTC. In the morning, they are given a haircut and their civilian clothes are taken away. The entire group of recruits, sometimes more than 200, is then given its "Moment of Truth" lecture. "Moment of Truth" is a high-pressure, emotional wake-up call. The recruits finally realize that they are no longer civilians and are now subject to the UCMJ. Recruits are given a final opportunity for amnesty. This is their last chance to reveal any previous offenses, including prior drug use not disclosed at MEPS.

A large fraction of the separated recruits, 400 out of 1825 in 1996, are separated for prior drug use without a positive urinalysis. For example, if a recruit admits to using cocaine two weeks prior to arrival at RTC, the recruit will be separated for drug use. This recruit will not fail the GC/MS urinalysis at RTC because no cocaine metabolites remain in the urine. Many recruits also admit to using drugs which are not tested for by NDSL during initial recruit urinalysis.

2. Value of Perfect Pre-screening

This thesis estimates 1996 drug-attrition costs based on 1,825 recruits from 63 MEPS at $2,700,000. Since "Moment of Truth" attrition is a fixed cost, recruits will continue to be separated for drugs at RTC regardless of what testing program is implemented at MEPS. If MEPS pre-screening were 100-percent effective, and no recruit failed the RTC urinalysis, there would still be at least $1,000,000 spent each year separating recruits due to "Moment of Truth" confessions. The value of perfect pre-screening at MEPS is the difference between these two costs. An optimal testing program at MEPS can be expected to save no more than $1,700,000 per year.

E. SUMMARY

RTC estimates that 85 percent of its recruits are male. Table 4 shows that the marginal attrition costs, for the hypothetical 85 percent male recruit, are significantly less than those estimated by the GAO. It is inappropriate to list berthing as a marginal cost since the barracks must be maintained regardless of the number of occupants. The GAO did not estimate supervision or legal costs and assumed that the average length of stay was 26 days. The GAO assumed that attrition costs for the other services were similar to the Navy's estimate of $4700. By extrapolating these costs to the entire DOD, the GAO overestimated the potential savings of drug screening at MEPS. Additional testing at MEPS can be expected to save the Navy no more than $1,700,000 per year.

MEPS	Airfare to RTC	Bus Home	Total
Albany(01)	$117	$99	$1,142
Albuquerque(36)	$180	$125	$1,231
Amarillo(37)	$188	$109	$1,223
Anchorage(81)	$299	$295	$1,520
Atlanta(20)	$106	$68	$1,100
Baltimore(02)	$78	$75	$1,079
Beckley(21)	$365	$75	$1,366
Boise(70)	$459	$143	$1,528
Boston(03)	$120	$109	$1,155
Buffalo(04)	$109	$59	$1,094
Butte(71)	$328	$129	$1,383
Charlotte(22)	$155	$91	$1,172
Columbus(57)	$162	$115	$1,203
Dallas(38)	$124	$103	$1,153
Denver(39)	$73	$53	$1,052
Des Moines(58)	$102	$43	$1,071
Des Plains(54)	$0	$5	$931
Detroit(59)	$52	$24	$1,002
El Paso(40)	$245	$93	$1,264
Fargo(60)	$203	$98	$1,227
Fort Jackson(24)	$171	$93	$1,190
Fresno/Sacramento(72)	$228	$123	$1,277
Harrisburg(06)	$127	$98	$1,151
Honolulu(73)	$283	$279	$1,488
Houston(41)	$118	$93	$1,137
Indianapolis(61)	$55	$30	$1,011
Jackson(42)	$131	$66	$1,123
Jacksonville(25)	$203	$103	$1,232
Kansas City(43)	$60	$43	$1,029
Knoxville(26)	$273	$64	$1,263
Little Rock(44)	$105	$70	$1,101
Los Angeles(74)	$181	$96	$1,203
Louisville(27)	$139	$36	$1,101
Memphis(45)	$113	$58	$1,097
Miami(23)	$148	$93	$1,167
Milwaukee(62)	$74	$16	$1,016
Minneapolis(63)	$71	$61	$1,058
Montgomery(28)	$126	$75	$1,127
Nashville(29)	$74	$59	$1,059
New Orleans(46)	$130	$69	$1,125
New York City(05)	$111	$83	$1,120
Oakland(75)	$404	$95	$1,425
Oklahoma City(47)	$87	$93	$1,106
Omaha(64)	$109	$39	$1,074
Philadelphia(10)	$109	$76	$1,111
Phoenix(76)	$159	$106	$1,191
Pittsburgh(11)	$103	$63	$1,092
Portland ME(12)	$148	$127	$1,201
Portland OR(77)	$235	$113	$1,274
Puerto Rico(30)	$262	$258	$1,446
Raleigh(31)	$130	$93	$1,149
Richmond(32)	$164	$93	$1,183
Salt Lake City(78)	$165	$104	$1,195
San Antonio(48)	$162	$93	$1,181
San Diego(67)	$183	$103	$1,212
Seattle(79)	$201	$97	$1,224
Shreveport(49)	$192	$93	$1,211
Sioux Falls(65)	$140	$73	$1,139
Springfield(13)	$177	$101	$1,204
Spokane(80)	$249	$109	$1,284
St. Louis(66)	$58	$25	$1,009
Syracuse(14)	$130	$83	$1,139
Tampa(17)	$205	$93	$1,224

Table 4 Marginal Separation Costs for a 85% Male Recruit

V. COST ANALYSIS MODEL

This chapter discusses the cost analysis optimization model and its computer implementation. A graphical representation of the optimization model is shown in Figure 2.

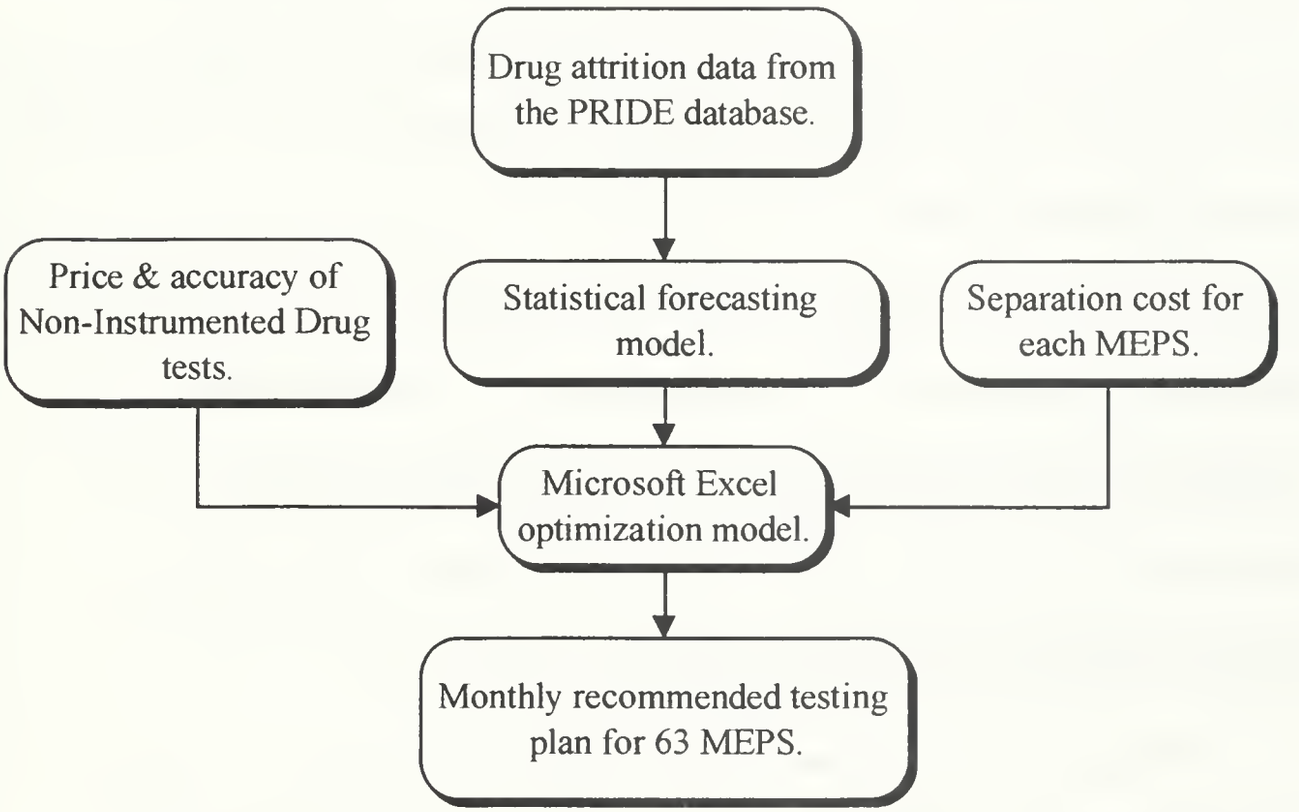

Drug attrition data from the PRIDE database.
Price & accuracy of Non-Instrumented Drug tests.
Statistical forecasting model.
Separation cost for each MEPS.
Microsoft Excel optimization model.
Monthly recommended testing plan for 63 MEPS.

Figure 2 Optimal Drug Testing Plan Inputs

The optimization model uses the user defined NIDT accuracy and cost discussed in Chapter II, the expected number of drug users found by the statistical model discussed in Chapter III, and the separation costs discussed in Chapter IV. The optimization model is coded as a Microsoft Excel workbook [Ref 8]. This chapter will also discuss the sensitivity analysis of the optimization model formulated as a decision tree.

A. MODEL FORMULATION

1. Discussion

The objective of the optimization model is to recommend a testing plan for each MEPS which minimizes separation costs at RTC. The options are: to do no testing at MEPS; to test for THC only; or to test for THC, cocaine and methamphetamine. The model will choose the best of the three options above to provide an optimal testing plan for each MEPS in each month.

The "no testing" option would be chosen if few drug users were expected relative to the number of accessions or if the separation costs for a particular MEPS were low. No testing at MEPS was the status quo, and it is assumed that the drug users will be caught at RTC by GC/MS urinalysis. The cost of not testing is simply the number of drug users multiplied by the separation costs.

Choosing to test for marijuana is more complicated. The single NIDT must be given to everyone at a given MEPS, so the cost includes the kit price of $5 times the number of accessions. The NIDT may be assumed to be imperfect; false negatives will occur. The marijuana users who beat the test at MEPS will fail at RTC and be separated. This separation cost must be included if the decision to use the NIDT is made. False positives must also be accounted for. A fraction of the accessions processed in the MEPS will fail the test and require a GC/MS urinalysis test, which costs $10. That fraction must also be bused from the MEPS to home and returned to the MEPS a week

later when the test results are known. The estimated cost of retesting a false positive is $50. The actual marijuana users who fail the NIDT will require GC/MS urinalysis testing. Since the NIDT is sensitive only to THC, the separation costs of the cocaine and methamphetamine users must also be added.

If multiple testing were chosen, then the most expensive NIDT would be given to everyone passing through the MEPS. The separation costs of the false negatives and false positive retest costs must be added. Finally, the verification retest costs for the actual drug users must be included.

2. Assumptions

- The GC/MS urinalysis test used by the Navy at NDSL is a perfect test with no false positives or negatives.
- Confirmation retests, of drugs identified by the NIDT, given at MEPS use GC/MS which is perfect.
- The GC/MS retest checks only for those drugs identified by the NIDT.
- Individuals do not mix drugs. Cocaine users do not use both cocaine and marijuana.
- False positive rates are for the test kit used not the drug used.
- Individuals who retest negative after failing a NIDT, a false positive, do not use drugs between the time the retest is administered and the results are received by MEPS. All false positive recruits go to boot camp.

3. Formulation

Indices

d drug: THC, Cocaine and Methamphetamine
t time period: January, February, March ...
k NIDT kit: Single or Multi
m MEPS: Albany, Oakland, Dallas...

Units

1996 dollars and Recruits

Data

$accessions_{t, m}$ expected number of accessions in period t from MEPS m.
$sc_{t, m}$ separation cost from boot camp in period t for recruits from MEPS m
$users_{d, t, m}$ expected number of users of drug d during period t from MEPS m.
fpr_k false positive rate for kit k = P(failing kit k | non drug user)
$fnr_{d, k}$ false negative rate for drug d for kit k = P(passing kit k for drug d | use drug d)
$kit.price_k$ cost of NIDT k
rc retest cost of an individual failing a NIDT
fixed.cost the fixed separation costs at RTC.

Decision Cost Equations

Option 1: No testing at MEPS, send all recruits directly to RTC.
$NT_{t, m}$ cost of not testing during period t at MEPS m.
$NT_{t, m}$ = (separation costs for all drug users)

$$NT_{t, m} = \left(\sum_{d} users_{d, t, m} * sc_{t, m} \right)$$

Option 2: Test for THC at MEPS
$ST_{t, m}$ cost of testing for a single drug THC during period t at MEPS m
$ST_{t, m}$ = (cost of testing all accessions) + (separation costs for NIDT false negatives) +
(confirmation costs for NIDT true positives) +
(confirmation costs for NIDT false positives) +
(separation costs for cocaine/methamphetamine users)

$$ST_{t, m} = (accessions_{t, m} * kit.price_{single}) + (users_{THC, t, m} * fnr_{single, THC} * sc_{t, m}) +$$
$$([1 - fnr_{single, THC}] * users_{THC, t, m} * rc) +$$
$$(fpr_{single} * accessions_{t, m} * rc) +$$
$$(users_{coc \& meth, t, m} * sc_{t, m})$$

Option 3: Test for all drugs at MEPS

$MT_{t, m}$ cost of testing for all drugs during period t at MEPS m

$MT_{t, m}$ = (cost of testing all accessions) + (separation costs for NIDT false negatives) +
(confirmation costs for NIDT true positives) +
(confirmation costs for NIDT false positives)

$$MT_{t, m} = (accessions_{t, m} * kit.price_{multi}) + \left(\sum_{d} users_{d, t, m} * fnr_{multi, d} * sc_{t, m} \right) +$$

$$\left(\sum_{d, m} users_{d, t, m} * [1 - fnr_{multi, d}] * rc \right) +$$

$$(fpr_{multi} * accessions_{t, m} * rc)$$

Formulation

$$Z = \sum_{t, m} \min (NT_{t, m}, ST_{t, m}, MT_{t, m}) + fixed.cost$$

B. COMPUTER IMPLEMENTATION

The model was implemented as a Microsoft Excel workbook. The user can input price and effectiveness of the NIDT being considered. The recommended testing program is summarized along with the heuristic solutions of single testing and multiple testing.

C. SENSITIVITY ANALYSIS OF DECISION MODEL

1. Decision Tree Model

The decision whether or not to test at a given MEPS in a given month can be modeled as a decision tree, as shown in the Figure 3. Modeling the problem in this way allows qualitative sensitivity analysis to be performed.

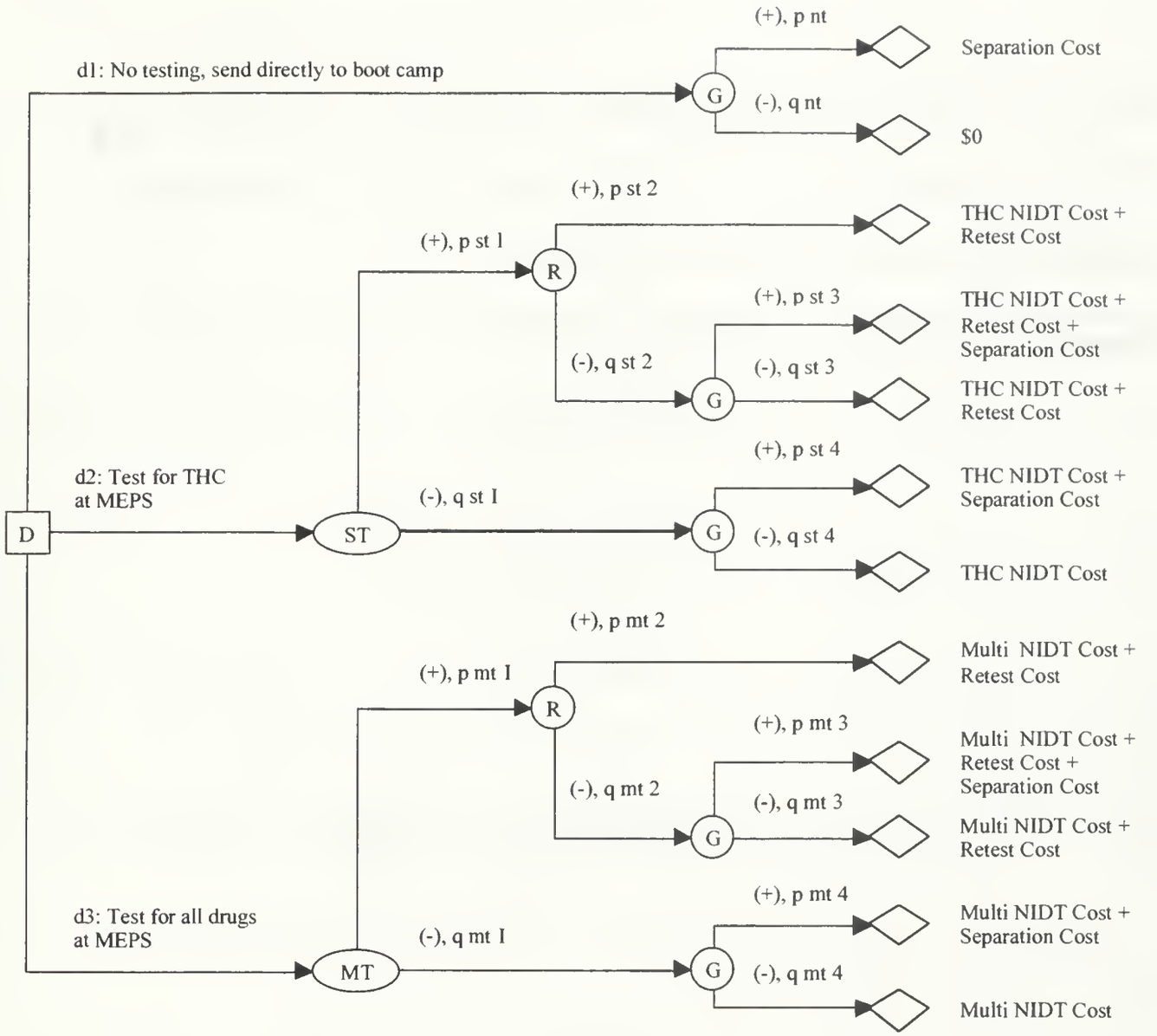
In Figure 3, decision nodes are represented by squares. In this case, there are three options. First, d1, no testing, could be chosen. Second, d2, testing using a THC

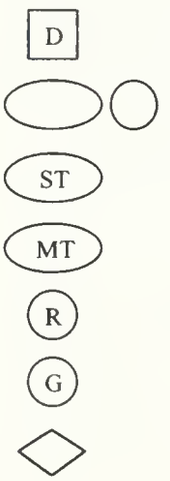
only NIDT, could be chosen. Finally, d3, testing for THC, cocaine and methamphetamine with a NIDT, could be chosen.

Random events are represented by circular or oval nodes. The "ST" node represents the single drug NIDT. The "MT" node represents the multiple drug NIDT. The "R" node represents the GC/MS retest given at MEPS upon failure of a NIDT. The "G" node represents the GC/MS test given on the day of arrival at boot camp. Each random event has one of two random outcomes. The test can be failed if drugs are detected with probability p or passed with probability (1-p) = q.

Penalties are represented by diamonds. Each penalty depends on the path chosen. For example, if d2 is chosen, the single test is passed, and the GC/MS test is failed at RTC; the penalty is the separation cost and the price of the NIDT.

The probability of failing a test also depends on the path chosen.





D — Decision node. Choose the mimimum of the set {d1, d2, d3}.

Random event nodes with two possible outcomes; failure, (+), with probability p and success, (-), with probability q.

ST — Single drug (THC) Non-Instrumented Drug Test (NIDT) given at MEPS.

MT — Multiple drug Non-Instrumented Drug Test (NIDT) given at MEPS.

R — GC/MS retest given at MEPS.

G — GC/MS drug test given for all drugs at boot camp.

Penalty node.

Figure 3 Decision Tree Drug Testing Policy Model

For example, $p_{st\ 4}$ is the probability that an individual fails the GC/MS drug test at RTC, given that the individual passed the THC-only NIDT at MEPS. The formulas for calculating each p and q are listed in Table 5. Prevalence ($Prev_d$) is defined to be the probability that a recruit will be a user of drug "d."

Parameter	Definition	Equation
$p_{nt\ 1}$	P(G+)	$Prev_{THC} + Prev_{C\&M}$
$p_{st\ 1}$	P(ST+)	$Prev_{THC}(1\text{-}FNR_{THC}) + FPR_{ST}$
$p_{st\ 2}$	P(R+ | ST+)	$Prev_{THC}(1\text{-}FNR_{THC})$ / PST 1
$p_{st\ 3}$	P(G+ | R-, ST+)	$(Prev_{C\&M})\ FPR_{ST}$
$p_{st\ 4}$	P(G+ | ST-)	$Prev_{THC}(FNR_{THC}) + Prev_{C\&M}\ (1\text{-}FPR_{ST})$
$p_{mt\ 1}$	P(MT+)	$Prev_{THC}(1\text{-}FNR_{THC}) + Prev_{C\&M}(1\text{-}FNR_{C\&M}) + FPR_{MT}$
$p_{mt\ 2}$	P(R+ | MT+)	$[\ Prev_{THC}(1\text{-}FNR_{THC}) + Prev_{C\&M}(1\text{-}FNR_{C\&M})\ ]$ / Pmt1
$p_{mt\ 3}$	P(G+ | R-, MT+)	0
$p_{mt\ 4}$	P(G+ | MT-)	$Prev_{THC}(FNR_{THC}) + Prev_{C\&M}(FNR_{C\&M})$

Table 5 Probability Equations Used in Figure 3

2. Sensitivity Analysis

The sensitivity analysis assumes a baseline case. One or two parameters are varied at a time to see how the testing policies change. The baseline case assumptions are listed in Table 6.

Parameter	Baseline Value
Separation Cost	$1200
Retest Cost	$50
THC NIDT Cost	$5
Multi NIDT Cost	$20
$Prev_{THC}$	3%
$Prev_{C\&M}$	1%
FNR_{THC} and $FNR_{C\&M}$	5%
FPR_{ST} and FPR_{MT}	5%

Table 6 Baseline Assumptions Used in Sensitivity Analysis

By rolling back the decision tree the expected cost per recruit can be determined for each of the three decisions. For example, the expected cost of d1 is ($p_{nt\ 1}$ * Separation Cost + $q_{nt\ 1}$ * $0). The baseline cost of d1, d2, and d3 are respectively $48, $21 and $27. Sensitivity analysis is performed by varying the parameters in Table 6 one at a time to produce Figure 4 [Ref 9].

The change in expected cost per recruit is plotted on the horizontal axis. Each parameter was varied over a reasonable range. The width of each of the eight bars represents the range of possible outcomes generated by varying the parameters one at a time. The visual fulcrum of this plot is the baseline optimal solution of $21.

For example, Figure 4 shows that the expected cost per recruit varies from $11 to $30 as $Prev_{C\&M}$ varies from zero to five percent.

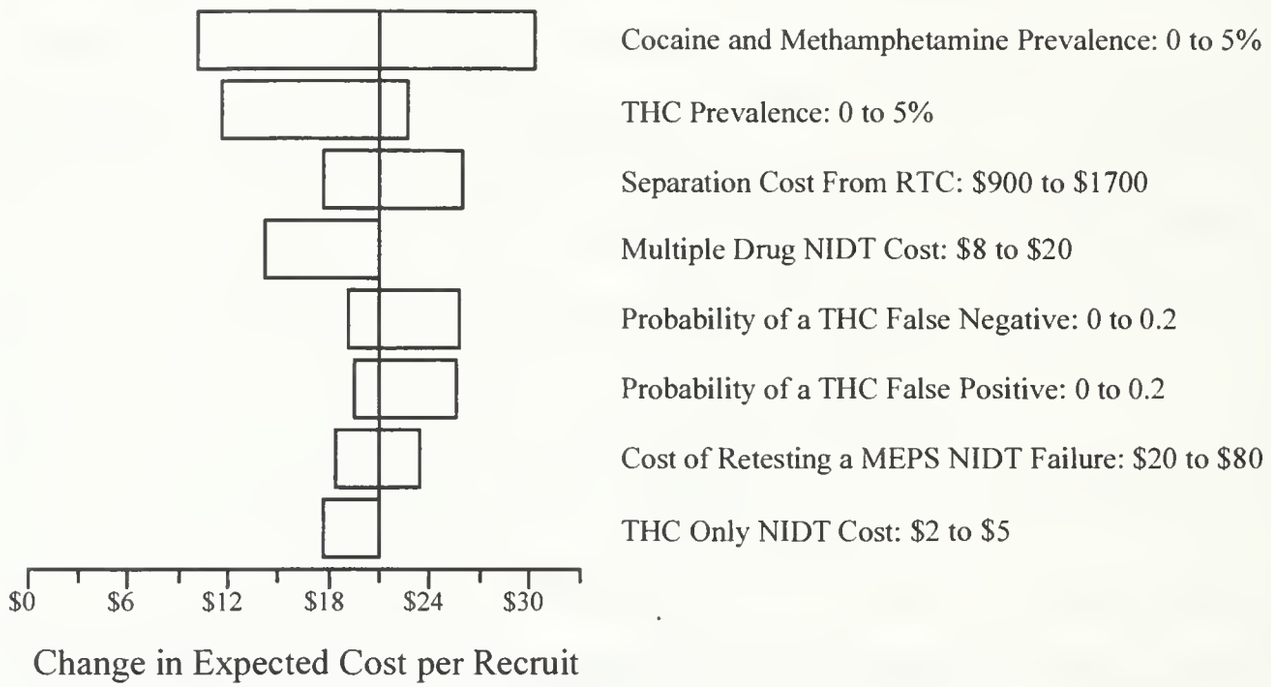

Cocaine and Methamphetamine Prevalence: 0 to 5%
THC Prevalence: 0 to 5%
Separation Cost From RTC: $900 to $1700
Multiple Drug NIDT Cost: $8 to $20
Probability of a THC False Negative: 0 to 0.2
Probability of a THC False Positive: 0 to 0.2
Cost of Retesting a MEPS NIDT Failure: $20 to $80
THC Only NIDT Cost: $2 to $5
$0
$6
$12
$18
$24
$30
Change in Expected Cost per Recruit

Figure 4 Sensitivity Analysis of Relevant Parameters

Separation costs are a large factor in the expected cost per recruit. Separation costs, which include different transportation costs, could vary from $900 to $1500. The plot is shown in Figure 5. Note that for the baseline case the optimal solution, indicated by the lowest line, doesn't change. For the baseline case of Table 6 the least expensive testing plan is to test for THC on the day of shipping.

By varying both $Prev_{THC}$ and $Prev_{C\&M}$ and holding the other parameters in Table 6 constant, the policy space, Figure 6, can be determined.

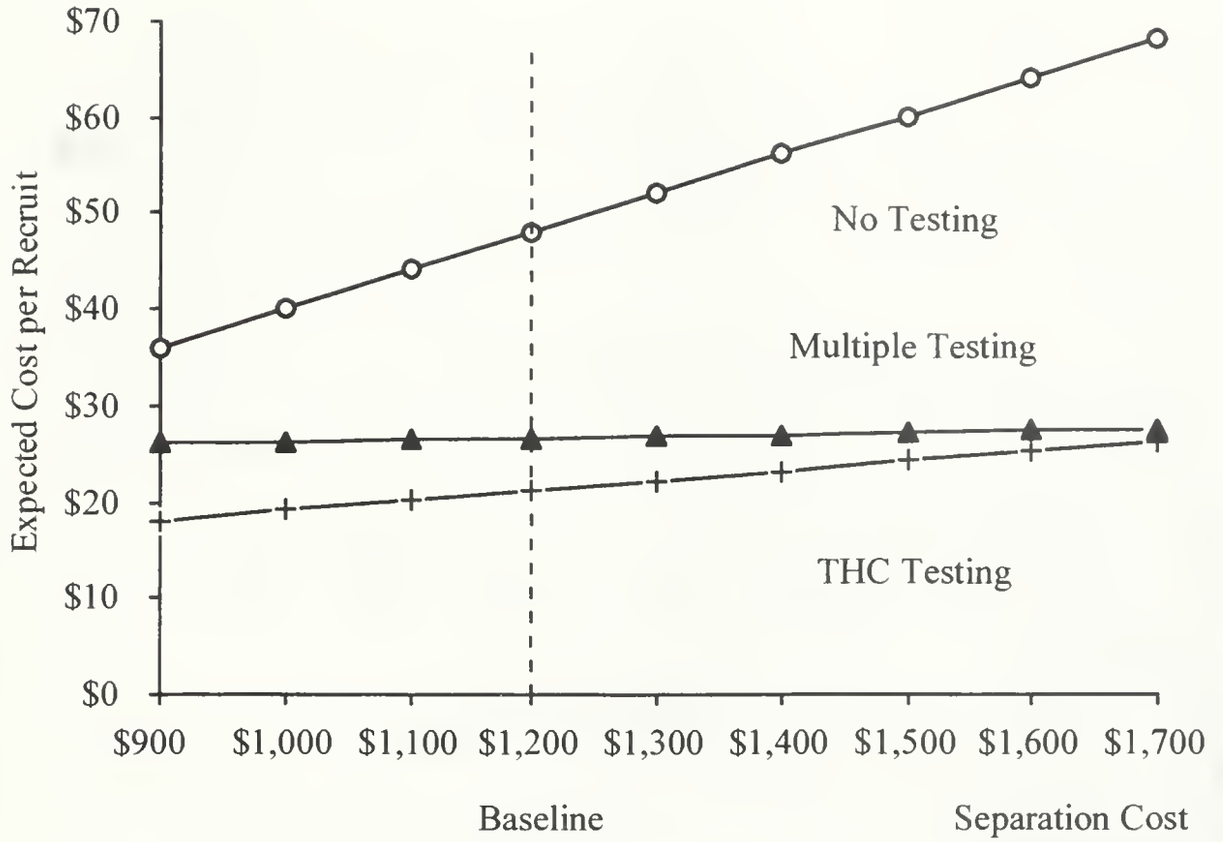


Figure 5 Sensitivity Analysis on the Separation Cost From Recruit Training Command vs. Expected Cost per Recruit

When both $Prev_{THC}$ and $Prev_{C\&M}$ are low, d1(no testing) is optimal because the cost of testing is more expensive than separation. As $Prev_{THC}$ increases to above about 0.5%, testing for THC with a $5 NIDT becomes optimal. As $Prev_{C\&M}$ increases above 1.6%, testing for all drugs with a $20 NIDT becomes optimal.

Current prices for the NIDT are $5 for a single drug and $20 for a four-drug test. The Navy may be able to negotiate a lower price. Figure 7 shows how the policy for which test to use should vary as a function of kit prices.

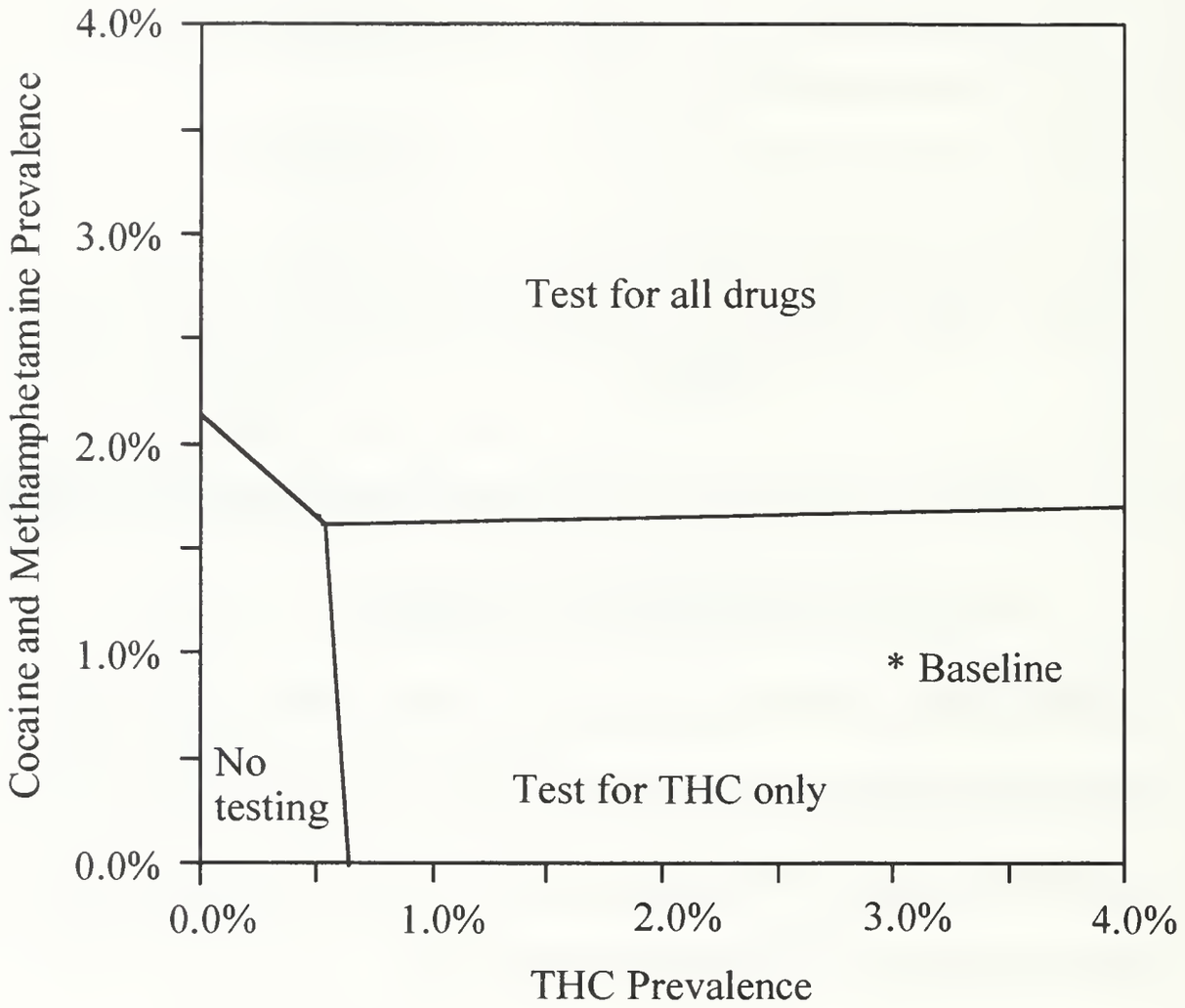


Figure 6 Policy Space Based on THC Prevalence vs. Cocaine Prevalence

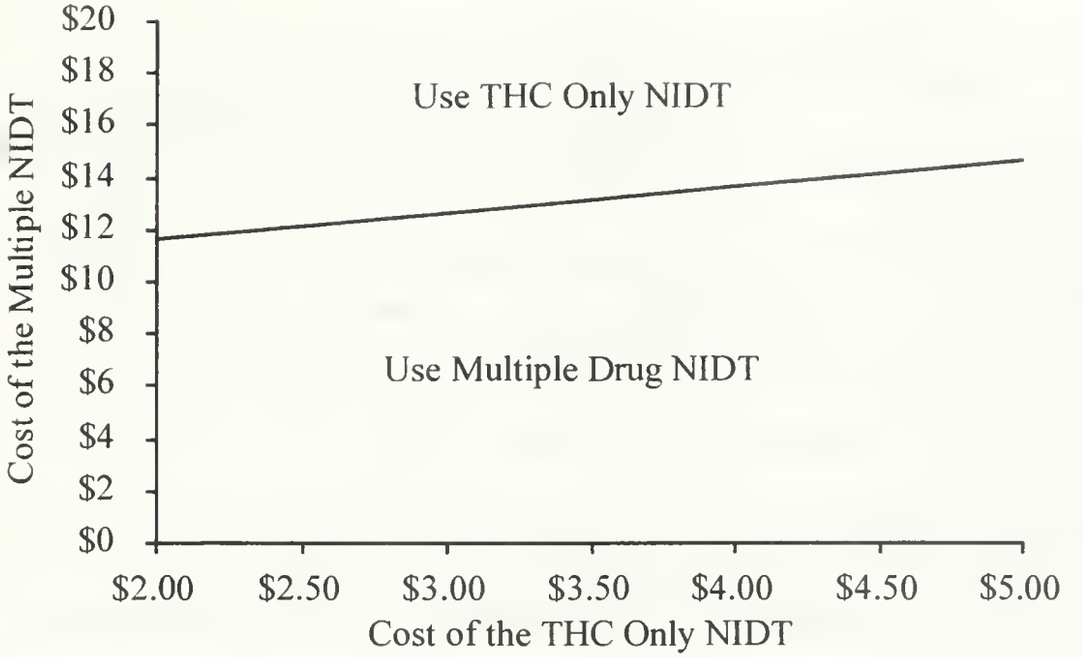


Figure 7 Sensitivity Analysis of Relative NIDT Kit Costs

Figure 7 above shows that the cost of the multiple drug test would have to be negotiated from $20 to less than $14 to be optimal for the baseline case. Similarly, if the price of the THC-only test were lowered to $4 the multiple drug NIDT would not be economical if it were more than $13.

The accuracy of NIDT has not been evaluated by the Navy. The manufacturers claim false positive rates and false negative rates as low as one percent. However, some studies suggest that they could be as high as twenty percent. Table 7 and Figure 8 show the effect on the expected cost per recruit as a function of test accuracy. While it is still cost effective to use NIDT at high false positive rates it may not be the best policy. For high false positive rates, e.g. 20%, the assumption that all false positive cases will go to boot camp is not valid. Many recruits, wrongly initially accused of drug use, will choose civilian life over entering the Navy.

	False Positive Rate and False Negative Rate of NIDT		
MEPS Testing Option	1%	5%	20%
d1: No testing	$48	$48	$48
d2: THC testing only	$19	$21	$30
d3: Test for all drugs	$23	$27	$39

Table 7 Expected Cost per Recruit vs. NIDT Inaccuracy

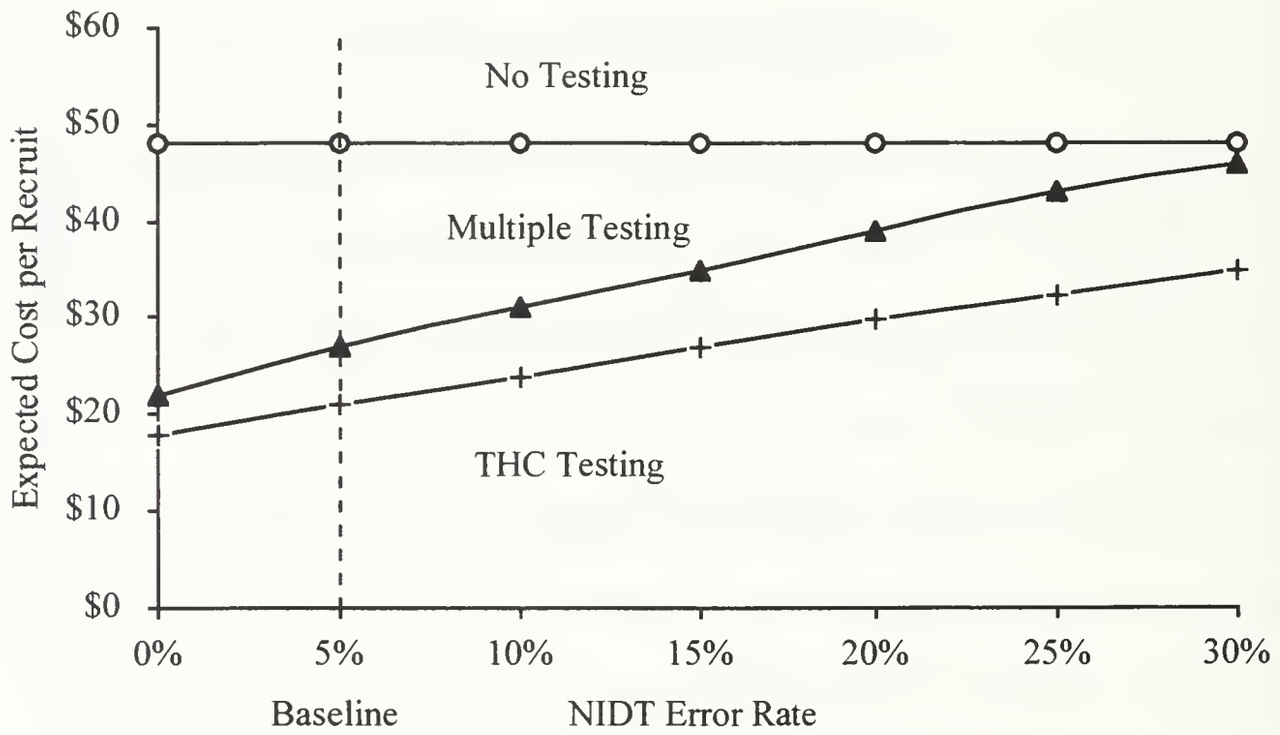


Figure 8 NIDT Inaccuracy vs. Expected Cost per Recruit

VI. OPTIMAL TESTING POLICIES

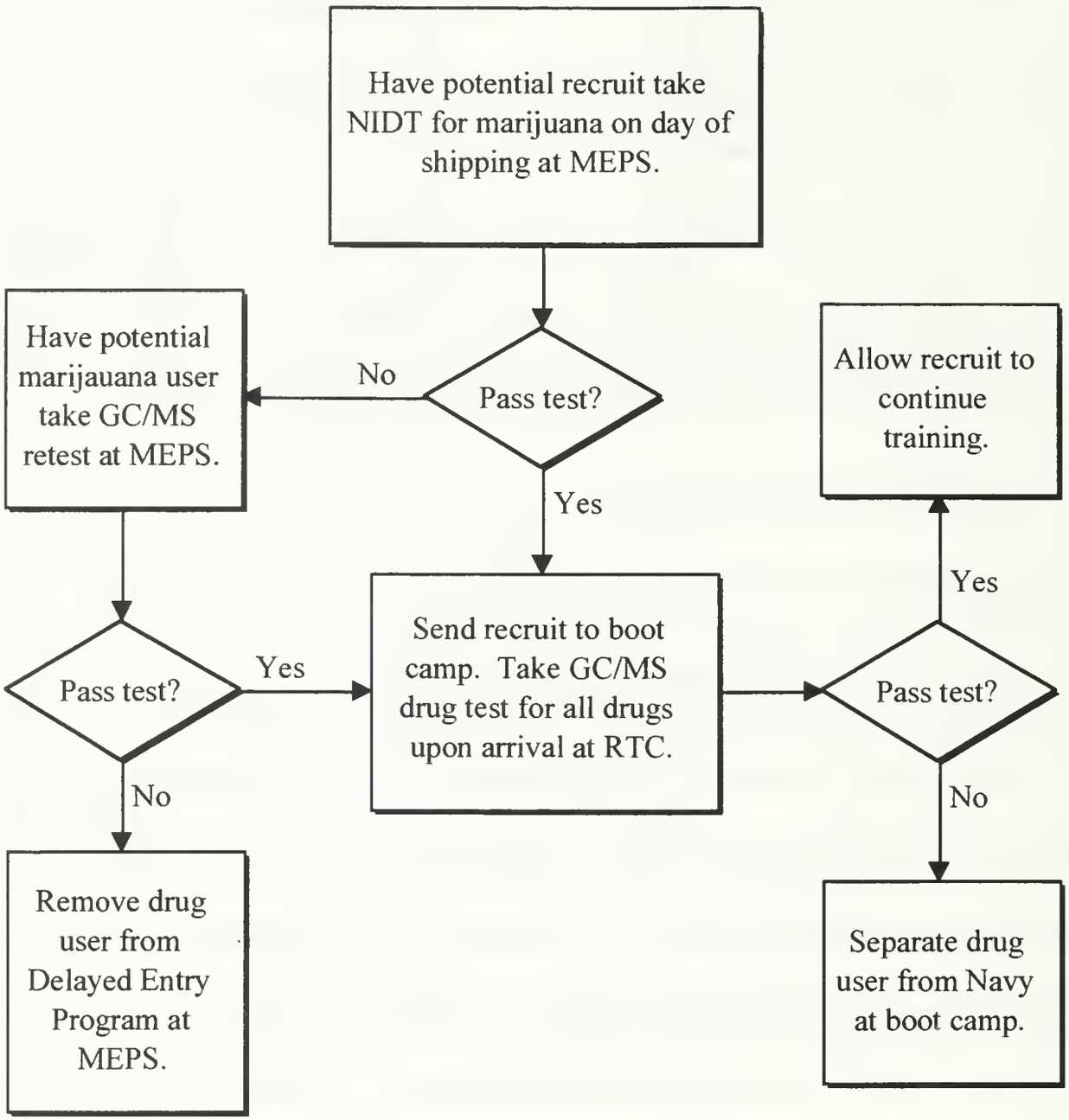
This chapter will discuss the optimal monthly drug-testing policy for each MEPS. The optimal decision must take into account that drug prevalence varies by MEPS and time of year. It must also depend on the actual separation cost for each recruit. The actual cost and accuracy of the NIDT is a factor in the testing program's expected benefit. However, the price and quality of the NIDT does not change the optimal policy in most cases. Regardless of which NIDT is used the Navy will save money by using it.

A. PROPOSED TESTING PLAN

My proposed testing plan is summarized in Figure 9.

B. OPTIMAL AND RECOMMENDED DRUG TESTING POLICIES

The Microsoft Excel decision model described in Chapter V produces an optimal testing plan for each month in each MEPS. The optimal testing plan for each set of assumptions can be found in Appendix I. The optimal policy depends on the expected proportion of drug users and may involve testing for all drugs at some MEPS and no testing at other MEPS. The recommended policy, Figure 9, is to test only for THC at all MEPS regardless of the time of year. Making the assumption that future recruiting goals will be the same as in the recent past, expected savings can be determined for each testing policy. These costs are listed in Table 8.


Have potential recruit take NIDT for marijuana on day of shipping at MEPS.
Pass test?
No
Have potential marijauana user take GC/MS retest at MEPS.
Yes
Send recruit to boot camp. Take GC/MS drug test for all drugs upon arrival at RTC.
Pass test?
Yes
No
Remove drug user from Delayed Entry Program at MEPS.
Pass test?
Yes
Allow recruit to continue training.
No
Separate drug user from Navy at boot camp.

GC/MS: Gas Chromatography / Mass Spectrometry
MEPS: Military Entrance Processing Station
NIDT: Non-Instrumented Drug Test
RTC: Recruit Training Command

Figure 9 Recommended Drug Testing Policy Flow Chart

Forecasted Annual Expected Fixed and Marginal Costs of not Testing: $3,000K									
Price of one NIDT in Dollars		Accuracy (100% - False Positive & False Negative Rates) of NIDT	Fixed Costs in K$	Optimal Marginal Costs in K$	Total in K$	Recom-mended Policy Marginal Costs in K$	Total in K$	Percent Difference	Recommended Policy Net Savings Over Not Testing
THC	Multi								
$5	$20	99%	$950K	$688K	$1,638K	$701K	$1,651K	0.8%	$1,349K
$5	$20	95%	$950K	$853K	$1,803K	$864K	$1,814K	0.6%	$1,186K
$5	$20	75%	$950K	$1,643K	$2,593K	$1,675K	$2,625K	1.2%	$375K
$5	$10	99%	$950K	$572K	$1,522K	$701K	$1,651K	8.5%	$1,349K
$5	$10	95%	$950K	$745K	$1,695K	$864K	$1,814K	7.0%	$1,186K
$5	$10	75%	$950K	$1,583K	$2,533K	$1,675K	$2,625K	3.6%	$375K

Table 8 Comparison of Optimal and Recommended NIDT Plans

Table 8 shows that by using a $5 test for marijuana at all MEPS will save the Navy more than $1,000,000 annually. Additional net savings could be realized by using optimal policy; however, these small savings are probably not worth the extra administrative costs of assigning specific testing requirements to each MEPS. Also, assigning every MEPS the same testing policy avoids the potential political difficulties of testing for all drugs at one MEPS, while requiring no testing at another.

C. OTHER PRE-SCREENING DRUG TESTING POLICIES

The GAO report published in January 1997 [Ref 1] suggested that the Navy could save millions by pre-screening for drug abuse at MEPS. In May 1997, the Navy began testing for marijuana and cocaine with GC/MS at some MEPS upon enlistment into the DEP. Between August and December of 1996 initial positive urinalysis attrition, as seen by RTC, was 3.6 percent. During the same period in 1997 attrition was 2.6 percent. A one percent drop in annual attrition will save the Navy $600,000 per year. The DEP testing policy has been ineffective for two reasons. First, pre-screening for cocaine is rarely cost-effective because the expected cocaine prevalence is low. Second, since

potential recruits could be in DEP for several months they have the opportunity for casual drug use between DEP entry and arrival at RTC. These two factors make it unlikely that this program will pay for itself. In fact, DEP testing may make the total cost of identifying and separating Navy recruits more expensive; therefore, the DEP testing program for marijuana and cocaine at MEPS should by reconsidered. The Navy will continue GC/MS testing for all drugs upon arrival at RTC; therefore, no drug users will remain in training regardless of the pre-screening policy used.

D. SUMMARY

Non-instrumented drug tests are a new, but well-established commercial-off-the-shelf technology (COTS). The Navy should begin testing for marijuana only at all MEPS on the "day of shipping" to RTC. This policy is not sensitive to variations in separation costs or NIDT accuracy. Testing for all drugs at MEPS is not recommended unless the cost of testing is cut in half or the expected cocaine and methamphetamine prevalence doubles. These tests provide the Navy with the opportunity to immediately reduce its marginal drug-related separation costs by more than $1,000,000 per year. It is not worth optimizing by city or month because continuously testing for marijuana everywhere results in 99% of the potential savings. Implementation of this new drug-testing policy could be done quickly and will have little effect on recruit flow from the MEPS to RTC. Pre-screening recruits for marijuana on the day of shipping will eliminate the largest fraction of drug abusers from the RTC training pipeline.

APPENDIX A. ACCESSIONS DATA

This appendix contains accessions data from the Navy's PRIDE database. The source of this data is the Navy's PRIDE database. The period of observation is from March 1995 to July 1997. This data was used in fitting the logistic regression model discussed in Chapter III.

MEPS_NUM	EVENT	9503	9504	9505	9506	9507	9508	9509	9510	9511	9512	9601	9602	9603	9604	9605	9606	9607	9608	9609	9610	9611	9612	9701	9702	9703	9704	9705	9706	9707
Albany_01	Accesions	5	18	19	8	24	19	30	38	32	31	40	49	49	25	37	26	59	63	70	49	73	48	55	34	30	15	28	61	77
Albuquerque_36	Accesions	11	6	14	8	18	24	24	26	33	17	24	23	16	8	20	24	24	27	16	31	34	24	25	20	20	9	27	28	38
Amarillo_37	Accesions	3	8	7	14	10	17	19	14	16	9	15	22	23	15	23	25	24	28	25	26	36	27	24	20	13	17	22	39	35
Anchorage_81	Accesions	0	1	0	1	5	2	4	7	13	7	9	11	15	8	12	13	4	8	8	8	11	10	7	11	8	10	11	4	14
Atlanta_20	Accesions	19	36	42	37	57	60	92	116	69	76	87	85	68	54	39	123	35	53	131	104	91	82	79	49	46	29	50	84	108
Baltimore_02	Accesions	10	38	59	30	42	62	78	122	91	91	86	75	77	55	47	77	109	119	91	95	109	89	90	45	48	32	59	100	138
Beckley_21	Accesions	6	9	18	23	19	27	26	37	19	22	31	23	17	14	10	38	32	31	27	50	23	16	19	15	11	13	11	37	37
Boise_70	Accesions	0	4	12	13	9	5	17	9	16	21	18	19	18	12	14	23	15	18	16	15	21	19	19	8	6	10	6	20	31
Boston_03	Accesions	10	27	42	24	28	51	73	64	56	52	62	50	57	40	26	52	76	76	73	74	72	74	49	32	24	17	37	53	71
Buffalo_04	Accesions	5	16	28	7	28	33	42	45	35	38	39	38	16	26	20	18	34	53	49	38	32	36	29	24	16	12	28	35	53
Butte_71	Accesions	1	4	5	12	4	7	11	18	14	12	22	18	6	11	13	33	24	20	23	24	27	9	13	18	11	12	14	34	31
Charlotte_22	Accesions	6	30	32	29	31	32	85	50	59	44	55	54	40	31	35	68	52	77	59	62	54	47	47	40	27	22	24	55	92
Chicago_54	Accesions	34	57	68	89	92	84	85	125	92	114	125	126	99	73	90	162	149	146	106	147	117	124	126	66	72	57	77	134	203
Columbus_57	Accesions	27	48	49	88	95	99	113	92	93	79	89	80	78	62	46	126	156	167	87	147	111	92	83	48	48	45	80	177	171
Dallas_38	Accesions	35	41	84	79	87	60	87	109	97	77	109	104	75	50	82	126	113	122	71	122	109	95	112	64	47	39	79	120	160
Denver_39	Accesions	13	37	49	58	105	68	96	86	56	70	82	75	81	44	79	111	68	89	73	88	87	78	90	77	47	47	63	95	92
Des_Moines_58	Accesions	3	12	29	25	26	15	37	38	30	26	39	23	26	19	25	49	36	56	42	46	47	23	32	25	22	18	18	36	47
Detroit_59	Accesions	11	29	44	31	71	63	71	55	61	42	59	61	53	44	31	55	81	77	69	84	57	50	57	26	37	24	26	63	94
El_Paso_40	Accesions	4	7	17	19	26	28	57	41	30	28	34	35	42	28	34	70	33	55	43	57	75	40	39	53	36	30	27	42	91
Fargo_60	Accesions	2	1	9	3	11	8	5	6	6	5	3	2	8	3	8	15	11	19	9	11	4	5	4	2	4	4	13	7	23
Fresno_Sacramento_72	Accesions	9	9	11	19	7	18	8	22	35	29	42	43	27	24	42	42	24	39	43	45	57	34	58	71	56	43	45	62	97
Ft_Jackson_24	Accesions	7	25	35	30	37	50	65	71	54	76	70	65	43	35	43	135	37	81	86	76	74	55	72	41	31	22	29	79	104
Harrisburg_06	Accesions	9	32	39	26	79	82	101	90	89	88	92	102	100	52	69	96	176	169	144	104	106	60	78	30	35	36	62	93	154
Honolulu_73	Accesions	1	4	6	6	8	7	11	8	11	11	9	12	5	13	17	20	11	13	17	17	21	7	17	14	12	16	12	15	30
Houston_41	Accesions	22	31	52	58	50	35	60	125	166	138	199	153	109	75	106	162	129	142	136	144	143	117	123	61	70	54	75	128	176
Indianapolis_61	Accesions	25	23	48	87	70	80	69	90	76	74	88	105	83	54	52	144	137	127	86	123	75	95	99	56	42	29	48	107	153
Jacksonville_25	Accesions	14	46	51	39	51	57	66	99	106	89	126	88	66	57	47	152	120	132	105	139	136	109	110	61	75	44	74	120	174
Jackson_42	Accesions	5	24	12	17	13	20	28	30	22	31	18	18	19	10	19	54	36	46	31	34	32	27	30	17	12	5	18	35	48
Kansas_City_43	Accesions	23	17	45	48	58	41	57	60	61	46	61	73	62	48	65	90	72	99	60	95	69	82	88	58	49	35	46	85	101
Knoxville_26	Accesions	5	18	14	11	18	21	33	19	24	28	44	21	19	19	15	56	39	28	19	44	47	36	33	16	17	15	28	50	56
Little_Rock_44	Accesions	5	16	18	20	26	35	37	31	30	29	32	28	19	12	29	61	25	50	31	39	28	23	26	22	11	10	41	39	49
Los_Angeles_74	Accesions	12	45	84	96	120	98	143	170	174	153	161	158	144	140	149	213	164	172	176	195	192	163	147	155	114	113	129	161	259
Louisville_27	Accesions	6	15	12	18	19	22	47	38	22	33	42	24	22	16	14	49	45	36	29	41	36	36	34	20	19	17	28	41	57
Memphis_45	Accesions	13	12	36	47	50	28	46	38	26	34	47	28	31	13	29	82	46	52	26	40	46	39	36	15	22	5	24	51	49
Miami_23	Accesions	10	28	26	40	47	50	51	67	65	55	60	58	39	30	34	68	59	63	52	71	75	57	60	31	25	13	27	52	103
Milwaukee_62	Accesions	7	5	16	23	36	25	42	36	37	43	43	35	18	27	37	72	58	50	24	63	32	34	33	26	16	19	31	55	74
Minneapolis_63	Accesions	11	14	16	42	34	36	37	60	49	41	46	34	37	28	29	75	66	62	50	56	52	43	50	32	30	16	28	55	81
Montgomery_28	Accesions	10	39	50	33	40	46	92	129	103	97	106	93	60	58	34	131	110	114	72	114	107	88	85	53	52	24	40	107	145
Nashville_29	Accesions	8	15	21	19	23	49	54	44	36	37	36	20	18	21	18	72	32	42	38	54	55	38	39	25	24	13	30	36	67
New_Orleans_46	Accesions	6	31	26	34	29	46	51	56	36	58	75	47	35	29	28	97	67	91	79	77	68	50	48	41	23	18	69	65	85
New_York_City_05	Accesions	25	69	106	55	64	147	114	199	183	183	196	208	163	159	142	95	205	204	191	197	255	181	168	135	115	83	183	178	239
Oakland_75	Accesions	29	32	55	84	48	72	78	164	160	158	137	149	155	134	114	210	147	149	146	165	178	136	130	108	77	55	56	133	183
Oklahoma_City_47	Accesions	4	29	56	62	56	58	65	50	55	61	79	47	37	36	55	119	53	64	44	68	73	54	52	34	39	29	54	68	88
Omaha_64	Accesions	6	8	15	11	14	12	21	22	10	15	22	25	21	7	27	41	33	27	25	35	33	12	33	19	15	9	37	34	36
Philadelphia_10	Accesions	5	37	45	12	16	46	38	79	58	85	69	67	56	43	36	43	61	88	71	92	73	67	60	32	37	25	30	64	100
Phoenix_76	Accesions	7	16	31	28	34	51	80	67	52	71	60	61	70	52	71	116	85	75	45	85	94	79	75	70	47	37	41	100	118
Pittsburgh_11	Accesions	11	23	37	18	26	43	46	58	49	43	68	70	59	41	36	44	77	69	70	48	59	61	47	30	21	20	37	58	101
Portland_ME_12	Accesions	13	13	18	18	14	29	34	43	24	27	38	41	23	20	9	25	31	48	49	32	28	28	20	15	10	8	25	23	32
Portland_OR_77	Accesions	13	14	17	25	36	28	61	65	59	54	61	61	57	45	42	66	57	71	67	87	86	65	68	61	49	41	42	64	69
Raleigh_31	Accesions	17	33	37	42	44	42	87	104	72	71	70	60	42	39	23	114	74	61	43	78	79	67	69	40	24	11	50	76	92
Richmond_32	Accesions	18	47	53	33	59	78	81	107	101	102	112	98	66	63	60	108	93	130	104	102	122	106	102	81	74	62	68	85	133
Salt_Lake_City_78	Accesions	3	13	12	10	13	13	26	21	18	15	21	22	16	18	21	28	16	22	23	18	22	24	23	25	19	22	21	29	37
San_Antonio_48	Accesions	5	30	36	26	42	56	74	75	96	73	90	81	78	56	72	124	74	100	77	93	78	74	79	76	61	54	61	72	84
San_Diego_67	Accesions	22	42	42	48	46	71	72	198	217	191	205	207	164	188	188	230	172	173	169	205	233	159	170	161	126	127	150	153	226
San_Juan_PR_30	Accesions	3	10	8	10	6	10	17	14	15	17	20	14	12	9	7	16	7	25	10	11	20	11	14	13	8	5	13	11	12
Seattle_79	Accesions	6	9	20	23	26	41	37	62	51	58	69	60	61	49	58	87	78	71	52	98	95	62	66	61	43	47	50	89	119
Shreveport_49	Accesions	7	13	14	16	18	24	39	41	30	40	35	24	23	13	18	68	59	53	38	38	43	32	33	20	9	16	20	47	81
Sioux_Falls_65	Accesions	7	4	9	18	12	8	15	12	16	5	6	12	17	9	10	22	13	11	12	19	19	10	22	12	10	12	17	19	26
Spokane_80	Accesions	1	3	12	7	4	6	16	19	18	20	17	22	18	13	16	22	22	20	24	18	19	19	40	16	14	9	12	21	44
Spring_Field_13	Accesions	10	28	22	11	30	40	55	44	54	31	40	44	35	29	19	35	66	55	48	62	50	33	40	25	27	15	25	69	65
St_Louis_66	Accesions	7	26	57	54	40	61	46	110	100	90	96	90	68	59	77	108	91	113	91	120	104	85	99	72	50	56	63	99	153
Syracuse_14	Accesions	6	22	24	5	23	45	33	25	35	41	36	33	18	22	23	14	50	49	51	41	22	32	26	18	31	15	24	26	58
Tampa_17	Accesions	16	35	40	30	40	38	86	98	53	87	62	59	42	46	42	115	85	81	71	68	60	53	51	43	32	17	32	81	89

APPENDIX B. THC ATTRITION DATA

This Appendix contains attrition data for those recruits failing their initial urinalysis at RTC for marijuana. The source of this data is the Navy's PRIDE database. The period of observation is from March 1995 to July 1997. This data was used in fitting the logistic regression model discussed in Chapter III.

MEPS_NUM	DRUG EVENT	9503	9504	9505	9506	9507	9508	9509	9510	9511	9512	9601	9602	9603	9604	9605	9606	9607	9608	9609	9610	9611	9612	9701	9702	9703	9704	9705	9706	9707
Albany_01	THC Attrition		1	2		2	1	2	2	2	1		2					1		1	1	1	3	2	1	1			2	1
Albuquerque_36	THC Attrition							1		1	1		1								1	1	2		1		3	2		
Amarillo_37	THC Attrition						1	2	1					2		1					2				1	1				
Anchorage_81	THC Attrition									1				1									1			1				
Atlanta_20	THC Attrition	1	1	2	1	1		2	6	3	7	2	1	3	3	1	2	1	2	1	4	6	2	1	1	2		3	3	
Baltimore_02	THC Attrition		4	3		1	2		6	7		4	6	5	2		2	1	2	3	3	9	3	7	2	2	2	2	4	2
Beckley_21	THC Attrition			1			1	4		1	2	1	1		1	1		1		1	2	3	1	4	2	2			4	1
Boise_70	THC Attrition				2	1	1	1			1	1	1				1		1		1	2							1	
Boston_03	THC Attrition		2	2			4	6	2		3	1		1	1	1		2	3	1	3		2	1	2			2		
Buffalo_04	THC Attrition		1					1	2	2	2	1	1	1	2	1	1	1	1	1	1	1		1		2				
Butte_71	THC Attrition																			1		1		1				1	1	
Charlotte_22	THC Attrition		2	2			3	5	3	3	3	2	3	3	1		1	2		6	4	3	2	1	1	1	3	5	2	3
Chicago_54	THC Attrition	2	5	4	2	3	2	2	8	2	2	4	7	4	1	1	3	2	8	2	8	3	1	5	2	1	5	3	7	2
Columbus_57	THC Attrition	1	3	3	2	1	5	6	4	1	2	2	2		4	1	2	5	7		7	4	2	5	2			4	3	2
Dallas_38	THC Attrition	1		1	1	3	2	2	3	3	1	6	4	5	1	2	3	2	2		1	9	5	1	3	1	1	1	1	3
Denver_39	THC Attrition	1	1	3	2	7	4	4	6	1	7	3	3	1	1	3	2	1	1		3	1	3	2	2				1	1
Des_Moines_58	THC Attrition		1			2		2	1	1				2	2		3		1		3	3	1	2			2	1		1
Detroit_59	THC Attrition	1	1	1	2	2	6	5	5	2	1	6	1		2		2	1	4	1	7	4	4	2	1	1	2	2	3	2
El_Paso_40	THC Attrition				1			3		1		1	1	1	1	1	1		1			3			2	1	3	1	1	1
Fargo_60	THC Attrition												1			1							1							
Fresno_Sacramento_72	THC Attrition	1											1		2	3	1		1	1		4	1	2	3	2		1	2	1
Ft_Jackson_24	THC Attrition			4	3	1	2	5	3	1	1	1	1	1	1	2	5	1	2	4	6	3	5	5	2		1	1	3	
Harrisburg_06	THC Attrition	1			2	2	1	5	2		4	1	6	4	1	2	1	3	4	2	5	5	2	3	1	1	2	1	2	4
Honolulu_73	THC Attrition				1		1		1							1				1				1	2		1			
Houston_41	THC Attrition		1	1	1	1	1	3	2		1	3	1	6	1	1	2	5	1	2	3	8	2	5	4	3	2	2	6	2
Indianapolis_61	THC Attrition		1	1	1	3	3	3	3		2	6	4	4	2	1	3	3	1	3	7	5	3	4	1	3	5		2	2
Jacksonville_25	THC Attrition	1	1	3	1	1	2	1	2	2	4	4	4	2	7		4	6	2	1	3	5	2	7	5	5	3	4	6	2
Jackson_42	THC Attrition		1	1					1		1		1		1		1	1	3	2	2	2	2					2	2	
Kansas_City_43	THC Attrition	2		2		7	2	2	2	3	1	1	5	3		1	2	1	3		4	4	6	4	4	2	1	1	2	2
Knoxville_26	THC Attrition				2		1	2	2		1	3					2		1	1	1	4	4	1	3				1	1
Little_Rock_44	THC Attrition					1	2				1	2	2	1			1		2	1	2		1	5	2				1	1
Los_Angeles_74	THC Attrition		4	3	2	4	6	8	2	1	2	3	3	5	2	3	6		2	1	6	8	7	7	8	4	6	4	3	2
Louisville_27	THC Attrition	1	2	1	1		2	2	1	2	2	1		2				1		1	3	3	4	1	1	1	1	1		2
Memphis_45	THC Attrition	1	1	2	1	3	2	1	1	1		1	3	2		1		1	3		2	2	2	3		2		2	1	1
Miami_23	THC Attrition	1	1	2	2	1	1	2	2		2	3	3	2	3		2	2	1		2	1		3	2	2				
Milwaukee_62	THC Attrition			1		1			2	1	1			1	1		1	1			3	1		2		1	1			1
Minneapolis_63	THC Attrition				1	3	1	2	1		1	1	1	2			3	1	2		2	1	3	3	1			1	1	
Montgomery_28	THC Attrition		1	2	3		1	3	8	1	3	3	7	2	1		3		1	4	3	8	4	2	4	3	1	1	2	2
Nashville_29	THC Attrition		3		1		2	5	3	2	2				1	1	2		1	1	4	2	1	2	1	3	1	1	1	1
New_Orleans_46	THC Attrition			1	4		2	1	3		2	5	1	3	3		4	1	2	2	5	3	3	5	3	1	2	3	4	1
New_York_City_05	THC Attrition	2	3	4		2	8	8	7	5	7	9	9	7	6	1	5	5	5	3	9	7	6	5	3	7	5	6	11	4
Oakland_75	THC Attrition	2	2	2	2	4	2	1	5	6	2	2	4	3	6	3	2	2	2	2	5	7	6	7	4	3	2	2	3	1
Oklahoma_City_47	THC Attrition	1	4	1	4	4	4	6	2	1	3	4	2		3	2	2		5	5	4	4	4	1		3	1	2	3	1
Omaha_64	THC Attrition	1	1						2	2		2	2	1		3					4			1	1				2	1
Philadelphia_10	THC Attrition		1	1				1	2	3	3	1	4		1	1	2		1	1	5	1	2		2	2	1	1	2	2
Phoenix_76	THC Attrition					1	1	5	2		2	1	2	6	4	1	1		1			2	2	1	3	1	2	1	2	1
Pittsburgh_11	THC Attrition			1				3			1		3		1	1		2	1	1	1	2	7	2	1	1		1	2	3
Portland_ME_12	THC Attrition			1			1	3	1	1			1					3	2	3		2		1	2	1	1	2		
Portland_OR_77	THC Attrition				2				1	1	2	2	2	1	2		1			1	3	7		3	1	2	2	3	2	
Raleigh_31	THC Attrition	1	3	1	2	3	2	3	5	2	2	2	3	1	1	1	2	1			5	9	4	4	1	2	1	4	2	3
Richmond_32	THC Attrition	1	2	2	2	1	1	2	3	1	3	6	5	1	2	2	6	2	4	1	3	7	3	7	2	3	3	2	3	
Salt_Lake_City_78	THC Attrition					1	2		1			1	2									1	1			1		1	1	1
San_Antonio_48	THC Attrition		1			2	3		2	2	2	1	2	6		5	1		2		2	3	2	2	1	1	1		2	
San_Diego_67	THC Attrition		1	2	1	1	3	1	4	6	2		5	3	4	1	6	2	2		5	7	6	5	3	3	1		1	2
San_Juan_PR_30	THC Attrition				1																	1		1	1				1	
Seattle_79	THC Attrition		1			1			2		1				3		2	1	1	1	3	4		3	1		1	1	1	
Shreveport_49	THC Attrition		1	1	2		2	1	3	1		1	2			1	1	2	1	1	2				2				1	
Sioux_Falls_65	THC Attrition							1		1							1	1			2	1		2				1		
Spokane_80	THC Attrition							1		3			1				1		1		1			1	2		1			
Spring_Field_13	THC Attrition	1	1				3	1	1	1			3		3			1	1	1	1	2	2	2			1	1	1	
St_Louis_66	THC Attrition		2	1	3	1	4		7	5	2	1	4	3	2	1	3	2	2		3	4		4	4	5	2	5	8	1
Syracuse_14	THC Attrition		2								1		1								1		2		1				1	2
Tampa_17	THC Attrition		1	2	1	3	1	3	2	3	2	2	1	3	1	2	2	4	2	1	2	1	3	2	1	2			2	3

APPENDIX C. NON-CANNABIS ATTRITION DATA

This Appendix contains attrition data for those recruits failing their initial urinalysis at RTC for drugs other than marijuana. Personnel assigned this separation code were assumed to be cocaine or methamphetamine users. The source of this data is the Navy's PRIDE database. The period of observation is from March 1995 to July 1997. This data was used in fitting the logistic regression model discussed in Chapter III.

MEPS_NUM	DRUG EVENT	9503	9504	9505	9506	9507	9508	9509	9510	9511	9512	9601	9602	9603	9604	9605	9606	9607	9608	9609	9610	9611	9612	9701	9702	9703	9704	9705	9706	9707
Albany_01	Coc/Meth Attrition					1				1	1	1								1							1			1
Albuquerque_36	Coc/Meth Attrition									1							1											1		
Amarillo_37	Coc/Meth Attrition																													
Anchorage_81	Coc/Meth Attrition							1																						
Atlanta_20	Coc/Meth Attrition					2		1			1		1							3	1	1	1		1	1				2
Baltimore_02	Coc/Meth Attrition		2			1		1			1			2	1			1	2				3			1		1		2
Beckley_21	Coc/Meth Attrition																													
Boise_70	Coc/Meth Attrition														1															
Boston_03	Coc/Meth Attrition		1				1		2				1	2	2						1	1								
Buffalo_04	Coc/Meth Attrition			1					1		1								1											
Butte_71	Coc/Meth Attrition									1																				
Charlotte_22	Coc/Meth Attrition									1	1								1		1	1		1						1
Chicago_54	Coc/Meth Attrition		1						1		1	1	1	1	1	1		2	1			3		1	1	1	1			
Columbus_57	Coc/Meth Attrition						1									1					1	2				2	1			
Dallas_38	Coc/Meth Attrition	1		1			1			1			3	1	1	2	1		2		2	1	2	1	1			2		1
Denver_39	Coc/Meth Attrition			1						1				1			1				1	1	1		1	1			1	
Des_Moines_58	Coc/Meth Attrition							1										1		1										
Detroit_59	Coc/Meth Attrition			1									1				1	1		1								1		
El_Paso_40	Coc/Meth Attrition										1	1			1	1		1		1		2	2	1			1			1
Fargo_60	Coc/Meth Attrition																													
Fresno_Sacramento_72	Coc/Meth Attrition											1											1							
Ft_Jackson_24	Coc/Meth Attrition					1					1					1	2					2		1			1			
Harrisburg_06	Coc/Meth Attrition			1		2	1			2			2			1			1								1	1		
Honolulu_73	Coc/Meth Attrition																				1									
Houston_41	Coc/Meth Attrition		1		1					1	1	2	2	2	2			1			1	1	3		2			1		1
Indianapolis_61	Coc/Meth Attrition									2		1	1	1	2						1		2	3						
Jacksonville_25	Coc/Meth Attrition					1		1		1		1								1	1	3	2		1	2				
Jackson_42	Coc/Meth Attrition												1																	
Kansas_City_43	Coc/Meth Attrition	2				1										1	1				1	1					1			
Knoxville_26	Coc/Meth Attrition			1																	2									2
Little_Rock_44	Coc/Meth Attrition																													
Los_Angeles_74	Coc/Meth Attrition	1		4	3	2			1	1		1		1	2		1					3				1	1	1	1	3
Louisville_27	Coc/Meth Attrition											1																1		1
Memphis_45	Coc/Meth Attrition								1		1			1								1		2						1
Miami_23	Coc/Meth Attrition				1					3	2		2					1				1	1	2			1			2
Milwaukee_62	Coc/Meth Attrition						2									1				1					1					
Minneapolis_63	Coc/Meth Attrition								1	1		1																		
Montgomery_28	Coc/Meth Attrition		1	2				1	1		1			1						2								1		1
Nashville_29	Coc/Meth Attrition		1					1						1							1		1							
New_Orleans_46	Coc/Meth Attrition			2							1		1				1			1	1	1	1	1	1					
New_York_City_05	Coc/Meth Attrition		2	1			2		3	3	1	1	3	3	1	3		1	1	1	4	3	1		2	4		1		3
Oakland_75	Coc/Meth Attrition		1		1	1				1		1		3	1		2	1		2	1	4	1		1		1			1
Oklahoma_City_47	Coc/Meth Attrition		2									2											1	1	1	1			1	1
Omaha_64	Coc/Meth Attrition													1										1	1					1
Philadelphia_10	Coc/Meth Attrition		1			1			1		1	1	1	1		2	1				2	3	2	2	3	3	1			
Phoenix_76	Coc/Meth Attrition			2				1		1					1	1						1	1	2		1				1
Pittsburgh_11	Coc/Meth Attrition			1						2									1				2	1				1		2
Portland_ME_12	Coc/Meth Attrition																													
Portland_OR_77	Coc/Meth Attrition	1				1		1			1																			
Raleigh_31	Coc/Meth Attrition								1									1			1	1						1		
Richmond_32	Coc/Meth Attrition	1		1							1										1	1		2	1				1	
Salt_Lake_City_78	Coc/Meth Attrition																		1			2	1							
San_Antonio_48	Coc/Meth Attrition										2		3	1	2		1				2			2					1	1
San_Diego_67	Coc/Meth Attrition					2	1		1				1		1	1			3		1	2	2		1		1	1		
San_Juan_PR_30	Coc/Meth Attrition				1						1						1				1			1						
Seattle_79	Coc/Meth Attrition														1		1					1			1					1
Shreveport_49	Coc/Meth Attrition		1						1					1									1							
Sioux_Falls_65	Coc/Meth Attrition																													
Spokane_80	Coc/Meth Attrition																													
Spring_Field_13	Coc/Meth Attrition		1	2	1	1											2				3	3								
St_Louis_66	Coc/Meth Attrition		1	1	1				2			1	1				1		1		2		1							3
Syracuse_14	Coc/Meth Attrition																		1											
Tampa_17	Coc/Meth Attrition		2	2				3	1					1			1	1									1	1	1	

APPENDIX D. THC LOGISTIC REGRESSION COEFFICIENTS

This appendix contains the coefficients which were fitted in the logistic regression statistical model described in Chapter III. These coefficients can be used to estimate the probability of failing a urinalysis test at RTC for THC. Test type was a factor used in the analysis. Test A refers to the RIA analysis, used by NDSL, discussed in Chapter III. Test B refers to the original IA analysis, used by NDSL, discussed in Chapter III. Test C refers to the improved IA analysis, used by NDSL, discussed in Chapter III.

(Intercept)	-3.134263		
MEPSAlbany	0.000000	MEPSNew_Orleans_46	0.543626
MEPSAlbuquerque_36	-0.175440	MEPSNew_York_City_05	0.302984
MEPSAmarillo_37	-0.335646	MEPSOakland_75	0.039066
MEPSAnchorage_81	-0.395192	MEPSOklahoma_City_47	0.624097
MEPSAtlanta_20	0.150754	MEPSOmaha_64	0.360084
MEPSBaltimore_02	0.407030	MEPSPhiladelphia_10	-0.022667
MEPSBeckley_21	0.697789	MEPSPhoenix_76	-0.131036
MEPSBoise_70	0.275328	MEPSPittsburgh_11	-0.043391
MEPSBoston_03	0.020895	MEPSPortland_ME_12	0.254595
MEPSBuffalo_04	0.001218	MEPSPortland_OR_77	-0.084811
MEPSButte_71	-0.856828	MEPSRaleigh_31	0.482195
MEPSCharlotte_22	0.622096	MEPSRichmond_32	0.206372
MEPSChicago_54	0.246376	MEPSSalt_Lake_City_78	-0.170331
MEPSColumbus_57	0.147415	MEPSSan_Antonio_48	-0.215141
MEPSDallas_38	0.009320	MEPSSan_Diego_67	-0.413908
MEPSDenver_39	0.136926	MEPSSan_Juan_PR_30	-0.656663
MEPSDes_Moines_58	0.214671	MEPSSeattle_79	-0.481308
MEPSDetroit_59	0.597430	MEPSShreveport_49	0.090374
MEPSEl_Paso_40	-0.218812	MEPSSioux_Falls_65	-0.033832
MEPSFargo_60	-0.536494	MEPSSpokane_80	-0.064350
MEPSFresno_Sacramento_72	-0.102544	MEPSSpring_Field_13	-0.081887
MEPSFt_Jackson_24	0.426942	MEPSSt_Louis_66	0.283119
MEPSHarrisburg_06	0.116625	MEPSSyracuse_14	-0.716377
MEPSHonolulu_73	-0.027328	MEPSTampa_17	0.200700
MEPSHouston_41	-0.123235	Month01	0.000000
MEPSIndianapolis_61	0.235067	Month02	0.177599
MEPSJackson_42	0.230292	Month03	0.045745
MEPSJacksonville_25	0.306624	Month04	0.080305
MEPSKansas_City_43	0.355699	Month05	-0.298441
MEPSKnoxville_26	0.376170	Month06	-0.358025
MEPSLittle_Rock_44	0.166909	Month07	-0.758704
MEPSLos_Angeles_74	0.013361	Month08	-0.301286
MEPSLouisville_27	0.514856	Month09	-0.355335
MEPSMemphis_45	0.415589	Month10	0.078628
MEPSMiami_23	0.072727	Month11	0.040857
MEPSMilwaukee_62	-0.313543	Month12	-0.030971
MEPSMinneapolis_63	-0.007109	TestA	0.000000
MEPSMontgomery_28	0.229604	TestB	-0.512440
MEPSNashville_29	0.468778	TestC	-0.252083

APPENDIX E. FORECASTED THC PREVALENCE

This appendix contains a the forecasted THC prevalence for each MEPS and month. The forecast assumes that NDSL will continue to use the improved IA pre-screening test discussed in Chapter III.

	Month 01	Month02	Month03	Month04	Month05	Month06	Month07	Month08	Month09	Month10	Month11	Month12
MEPSAlbany	3.27%	3.88%	3.42%	3.54%	2.45%	2.31%	1.56%	2.44%	2.32%	3.53%	3.40%	3.18%
MEPSAlbuquerque_36	2.76%	3.28%	2.89%	2.98%	2.06%	1.95%	1.31%	2.06%	1.95%	2.98%	2.87%	2.68%
MEPSAmarillo_37	2.36%	2.81%	2.47%	2.55%	1.76%	1.66%	1.12%	1.76%	1.67%	2.55%	2.46%	2.29%
MEPSAnchorage_81	2.23%	2.65%	2.33%	2.41%	1.66%	1.57%	1.06%	1.66%	1.57%	2.41%	2.32%	2.16%
MEPSAtlanta_20	3.78%	4.49%	3.95%	4.09%	2.84%	2.68%	1.81%	2.83%	2.68%	4.08%	3.94%	3.67%
MEPSBaltimore_02	4.84%	5.72%	5.05%	5.22%	3.63%	3.43%	2.32%	3.62%	3.44%	5.21%	5.03%	4.70%
MEPSBeckley_21	6.37%	7.51%	6.64%	6.86%	4.80%	4.54%	3.09%	4.79%	4.55%	6.85%	6.61%	6.18%
MEPSBoise_70	4.27%	5.05%	4.46%	4.61%	3.20%	3.02%	2.04%	3.19%	3.03%	4.60%	4.44%	4.14%
MEPSBoston_03	3.34%	3.96%	3.49%	3.61%	2.50%	2.36%	1.59%	2.49%	2.36%	3.60%	3.47%	3.24%
MEPSBuffalo_04	3.28%	3.89%	3.42%	3.54%	2.45%	2.31%	1.56%	2.44%	2.32%	3.53%	3.41%	3.18%
MEPSButte_71	1.42%	1.69%	1.48%	1.53%	1.05%	0.99%	0.67%	1.05%	1.00%	1.53%	1.47%	1.37%
MEPSCharlotte_22	5.93%	7.00%	6.19%	6.39%	4 47%	4.22%	2.87%	4.46%	4.23%	6.38%	6.16%	5.76%
MEPSChicago_54	4.15%	4.92%	4.33%	4.48%	3.11%	2.94%	1.99%	3.10%	2.94%	4.47%	4.31%	4.03%
MEPSColumbus_57	3.77%	4.47%	3.94%	4.08%	2.83%	2.67%	1.80%	2.82%	2.67%	4.07%	3.92%	3.66%
MEPSDallas_38	3.30%	3.92%	3.45%	3.57%	2.47%	2.33%	1.57%	2.46%	2.34%	3.56%	3.44%	3.20%
MEPSDenver_39	3.73%	4.43%	3.90%	4.03%	2.80%	2.64%	1.78%	2.79%	2.65%	4.03%	3.88%	3.63%
MEPSDes_Moines_58	4.02%	4.77%	4.21%	4.35%	3.02%	2.85%	1.93%	3.01%	2.86%	4.34%	4.19%	3.91%
MEPSDetroit_59	5.79%	6.84%	6.05%	6.25%	4.36%	4.12%	2.80%	4.35%	4.13%	6.24%	6.02%	5.63%
MEPSEl_Paso_40	2.65%	3.14%	2.77%	2.86%	1.98%	1.86%	1.26%	1.97%	1.87%	2.86%	2.75%	2.57%
MEPSFargo_60	1.94%	2.31%	2.03%	2.10%	1.45%	1.36%	0.92%	1.44%	1.37%	2.10%	2.02%	1.88%
MEPSFresno_Sacramento_72	2.96%	3.52%	3.10%	3.20%	2.22%	2.09%	1.41%	2.21%	2.10%	3.20%	3.08%	2.88%
MEPSFt_Jackson_24	4.93%	5.83%	5.15%	5.32%	3.70%	3.50%	2.37%	3.69%	3.51%	5.31%	5.12%	4.79%
MEPSHarrisburg_06	3.66%	4.34%	3.83%	3.96%	2.74%	2.59%	1.75%	2.74%	2.60%	3.95%	3.81%	3.55%
MEPSHonolulu_73	3.19%	3.78%	3.33%	3.44%	2.38%	2.25%	1.52%	2.38%	2.26%	3.44%	3.32%	3.09%
MEPSHouston_41	2.90%	3.45%	3.04%	3.14%	2.17%	2.05%	1.38%	2.16%	2.05%	3.13%	3.02%	2.82%
MEPSIndianapolis_61	4.10%	4.86%	4.29%	4.43%	3.08%	2.90%	1.96%	3.07%	2.91%	4.42%	4.27%	3.98%
MEPSJackson_42	4.09%	4.84%	4.27%	4.41%	3.06%	2.89%	1.96%	3.06%	2.90%	4.40%	4.25%	3.97%
MEPSJacksonville_25	4.40%	5.20%	4.59%	4.75%	3.30%	3.11%	2.11%	3.29%	3.12%	4.74%	4.57%	4.27%
MEPSKansas_City_43	4.61%	5.45%	4.81%	4.97%	3.46%	3.27%	2.21%	3.45%	3.27%	4.96%	4.79%	4.47%
MEPSKnoxville_26	4.70%	5.56%	4.91%	5.07%	3.53%	3.33%	2.26%	3.52%	3.34%	5.06%	4.88%	4.56%
MEPSLittle_Rock_44	3.84%	4.56%	4.02%	4.15%	2.88%	2.72%	1.84%	2.87%	2.73%	4.15%	4.00%	3.73%
MEPSLos_Angeles_74	3.32%	3.93%	3.46%	3.58%	2.48%	2.34%	1.58%	2.47%	2.35%	3.58%	3.45%	3.22%
MEPSLouisville_27	5.36%	6.33%	5.59%	5.78%	4.03%	3.81%	2.58%	4.02%	3.82%	5.77%	5.57%	5.20%
MEPSMemphis_45	4.88%	5.77%	5.09%	5.26%	3.66%	3.46%	2.34%	3.65%	3.47%	5.25%	5.07%	4.73%
MEPSMiami_23	3.51%	4.16%	3.67%	3.79%	2.63%	2.48%	1.68%	2.62%	2.49%	3.79%	3.65%	3.41%
MEPSMilwaukee_62	2.41%	2.87%	2.52%	2.61%	1.80%	1.70%	1.14%	1.80%	1.70%	2.61%	2.51%	2.34%
MEPSMinneapolis_63	3.25%	3.86%	3.40%	3.51%	2.43%	2.29%	1.55%	2.43%	2.30%	3.51%	3.38%	3.15%
MEPSMontgomery_28	4.08%	4.84%	4.27%	4.41%	3.06%	2.89%	1.95%	3.05%	2.90%	4.40%	4.25%	3.96%
MEPSNashville_29	5.13%	6.07%	5.36%	5.53%	3.86%	3.64%	2.47%	3.85%	3.65%	5.53%	5.33%	4.98%
MEPSNew_Orleans_46	5.51%	6.51%	5.75%	5.94%	4.14%	3.91%	2.66%	4.13%	3.92%	5.93%	5.72%	5.35%
MEPSNew_York_City_05	4.38%	5.19%	4.58%	4.73%	3.29%	3.10%	2.10%	3.28%	3.11%	4.72%	4.55%	4.25%
MEPSOakland_75	3.40%	4.03%	3.55%	3.67%	2.54%	2.40%	1.62%	2.54%	2.41%	3.67%	3.54%	3.30%
MEPSOklahoma_City_47	5.94%	7.01%	6.20%	6.40%	4.48%	4.23%	2.87%	4.46%	4.24%	6.39%	6.17%	5.77%
MEPSOmaha_64	4.63%	5.48%	4.83%	4.99%	3.47%	3.28%	2.22%	3.46%	3.29%	4.98%	4.81%	4.49%
MEPSPhiladelphia_10	3.20%	3.80%	3.35%	3.46%	2.40%	2.26%	1.53%	2.39%	2.27%	3.45%	3.33%	3.11%
MEPSPhoenix_76	2.88%	3.42%	3.01%	3.12%	2.15%	2.03%	1.37%	2.15%	2.04%	3.11%	3.00%	2.80%
MEPSPittsburgh_11	3.14%	3.73%	3.28%	3.39%	2.35%	2.21%	1.49%	2.34%	2.22%	3.39%	3.26%	3.05%
MEPSPortland_ME_12	4.18%	4.95%	4.37%	4.52%	3.14%	2.96%	2.00%	3.13%	2.97%	4.51%	4.35%	4.06%
MEPSPortland_OR_77	3.01%	3.58%	3.15%	3.26%	2.25%	2.13%	1.43%	2.25%	2.13%	3.25%	3.14%	2.93%
MEPSRaleigh_31	5.19%	6.14%	5.42%	5.60%	3.91%	3.69%	2.50%	3.90%	3.70%	5.60%	5.40%	5.04%
MEPSRichmond_32	3.99%	4.73%	4.17%	4.31%	2.99%	2.83%	1.91%	2.99%	2.83%	4.31%	4.15%	3.88%
MEPSSalt_Lake_City_78	2.77%	3.30%	2.90%	3.00%	2.07%	1.96%	1.32%	2.07%	1.96%	2.99%	2.89%	2.69%
MEPSSan_Antonio_48	2.66%	3.16%	2.78%	2.87%	1.98%	1.87%	1.26%	1.98%	1.88%	2.87%	2.76%	2.58%
MEPSSan_Diego_67	2.19%	2.60%	2.29%	2.37%	1.63%	1.54%	1.04%	1.63%	1.54%	2.36%	2.28%	2.12%
MEPSSan_Juan_PR_30	1.72%	2.05%	1.80%	1.87%	1.29%	1.21%	0.81%	1.28%	1.21%	1.86%	1.79%	1.67%
MEPSSeattle_79	2.05%	2.44%	2.14%	2.22%	1.53%	1.44%	0.97%	1.52%	1.44%	2.21%	2.13%	1.99%
MEPSShreveport_49	3.57%	4.24%	3.73%	3.86%	2.67%	2.52%	1.70%	2.67%	2.53%	3.85%	3.71%	3.47%
MEPSSioux_Falls_65	3.17%	3.76%	3.31%	3 42%	2.37%	2.24%	1.51%	2.36%	2.24%	3.42%	3.29%	3.07%
MEPSSpokane_80	3.07%	3.65%	3.21%	3.32%	2.30%	2.17%	1.46%	2.29%	2.18%	3.32%	3.20%	2.98%
MEPSSpring_Field_13	3.02%	3.59%	3.16%	3.27%	2.26%	2.13%	1.44%	2.25%	2.14%	3.26%	3.15%	2.93%
MEPSSt_Louis_66	4.30%	5.09%	4.49%	4.64%	3.22%	3.04%	2.06%	3.22%	3.05%	4.63%	4.47%	4.17%
MEPSSyracuse_14	1.63%	1.94%	1.70%	1.76%	1.21%	1.14%	0.77%	1.21%	1.15%	1.76%	1.69%	1.58%
MEPSTampa_17	3.97%	4.71%	4.15%	4.29%	2.98%	2.81%	1.90%	2.97%	2.82%	4.28%	4.13%	3.85%

APPENDIX F. COCAINE AND METHAMPHETAMINE LOGISTIC REGRESSION COEFFICIENTS

This appendix contains the coefficients which were fitted in the logistic regression statistical model described in Chapter III. These coefficients can be used to estimate the probability of failing a urinalysis test at RTC for drugs other than marijuana.

(Intercept)	-5.194662	MEPSMontgomery_28	-0.227029
MEPSAlbany	0.000000	MEPSNashville_29	-0.171586
MEPSAlbuquerque_36	-0.268451	MEPSNew_Orleans_46	0.228062
MEPSAmarillo_37	-7.528794	MEPSNew_York_City_05	0.425523
MEPSAnchorage_81	-0.414583	MEPSOakland_75	0.050532
MEPSAtlanta_20	0.195492	MEPSOklahoma_City_47	0.033485
MEPSBaltimore_02	0.287328	MEPSOmaha_64	0.045473
MEPSBeckley_21	-7.660438	MEPSPhiladelphia_10	0.988577
MEPSBoise_70	-0.952356	MEPSPhoenix_76	0.060892
MEPSBoston_03	0.205960	MEPSPittsburgh_11	0.155730
MEPSBuffalo_04	-0.304529	MEPSPortland_ME_12	-7.781342
MEPSButte_71	-1.001951	MEPSPortland_OR_77	-0.895620
MEPSCharlotte_22	-0.155691	MEPSRaleigh_31	-0.713040
MEPSChicago_54	-0.041343	MEPSRichmond_32	-0.547963
MEPSColumbus_57	-0.691908	MEPSSalt_Lake_City_78	0.099033
MEPSDallas_38	0.421241	MEPSSan_Antonio_48	0.171991
MEPSDenver_39	-0.262723	MEPSSan_Diego_67	-0.466512
MEPSDes_Moines_58	-0.572221	MEPSSan_Juan_PR_30	0.830113
MEPSDetroit_59	-0.443691	MEPSSeattle_79	-0.734981
MEPSEl_Paso_40	0.629321	MEPSShreveport_49	-0.298997
MEPSFargo_60	-6.472002	MEPSSioux_Falls_65	-7.154333
MEPSFresno_Sacramento_72	-1.240804	MEPSSpokane_80	-7.349545
MEPSFt_Jackson_24	-0.080756	MEPSSpring_Field_13	0.650840
MEPSHarrisburg_06	-0.186196	MEPSSt_Louis_66	0.044759
MEPSHonolulu_73	-0.805922	MEPSSyracuse_14	-1.672180
MEPSHouston_41	0.134548	MEPSTampa_17	0.338276
MEPSIndianapolis_61	-0.076236	Month01	0.000000
MEPSJackson_42	-1.450219	Month02	0.313452
MEPSJacksonville_25	-0.124053	Month03	0.441269
MEPSKansas_City_43	-0.332812	Month04	0.529213
MEPSKnoxville_26	0.026999	Month05	0.344726
MEPSLittle_Rock_44	-7.870229	Month06	-0.521378
MEPSLos_Angeles_74	0.015334	Month07	-0.037739
MEPSLouisville_27	-0.526946	Month08	-0.426566
MEPSMemphis_45	0.165051	Month09	-0.347231
MEPSMiami_23	0.612075	Month10	0.125531
MEPSMilwaukee_62	-0.200031	Month11	0.484915
MEPSMinneapolis_63	-0.892704	Month12	0.339587

APPENDIX G. FORECASTED NON-THC PREVALENCE

This appendix contains the forecasted prevalence, for drugs other that marijuana, for each MEPS and month.

	Month01	Month02	Month03	Month04	Month05	Month06	Month07	Month08	Month09	Month10	Month11	Month12
MEPSAlbany	0.55%	0.75%	0.85%	0.93%	0.78%	0.33%	0.53%	0.36%	0.39%	0.62%	0.89%	0.77%
MEPSAlbuquerque_36	0.42%	0.58%	0.65%	0.71%	0.60%	0.25%	0.41%	0.28%	0.30%	0.48%	0.68%	0.59%
MEPSAmarillo_37	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MEPSAnchorage_81	0.37%	0.50%	0.57%	0.62%	0.51%	0.22%	0.35%	0.24%	0.26%	0.41%	0.59%	0.51%
MEPSAtlanta_20	0.67%	0.91%	1.04%	1.13%	0.94%	0.40%	0.65%	0.44%	0.47%	0.76%	1.08%	0.94%
MEPSBaltimore_02	0.73%	1.00%	1.14%	1.24%	1.03%	0.44%	0.71%	0.48%	0.52%	0.83%	1.19%	1.03%
MEPSBeckley_21	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MEPSBoise_70	0.21%	0.29%	0.33%	0.36%	0.30%	0.13%	0.21%	0.14%	0.15%	0.24%	0.35%	0.30%
MEPSBoston_03	0.68%	0.92%	1.05%	1.14%	0.95%	0.40%	0.65%	0.44%	0.48%	0.77%	1.09%	0.95%
MEPSBuffalo_04	0.41%	0.56%	0.63%	0.69%	0.57%	0.24%	0.39%	0.27%	0.29%	0.46%	0.66%	0.57%
MEPSButte_71	0.20%	0.28%	0.32%	0.34%	0.29%	0.12%	0.20%	0.13%	0.14%	0.23%	0.33%	0.29%
MEPSCharlotte_22	0.47%	0.65%	0.73%	0.80%	0.67%	0.28%	0.45%	0.31%	0.33%	0.54%	0.76%	0.66%
MEPSChicago_54	0.53%	0.72%	0.82%	0.90%	0.75%	0.31%	0.51%	0.35%	0.37%	0.60%	0.86%	0.74%
MEPSColumbus_57	0.28%	0.38%	0.43%	0.47%	0.39%	0.16%	0.27%	0.18%	0.20%	0.31%	0.45%	0.39%
MEPSDallas_38	0.84%	1.14%	1.30%	1.41%	1.18%	0.50%	0.81%	0.55%	0.59%	0.95%	1.35%	1.17%
MEPSDenver_39	0.42%	0.58%	0.66%	0.72%	0.60%	0.25%	0.41%	0.28%	0.30%	0.48%	0.69%	0.60%
MEPSDes_Moines_58	0.31%	0.43%	0.48%	0.53%	0.44%	0.19%	0.30%	0.20%	0.22%	0.35%	0.51%	0.44%
MEPSDetroit_59	0.35%	0.48%	0.55%	0.60%	0.50%	0.21%	0.34%	0.23%	0.25%	0.40%	0.57%	0.50%
MEPSEl_Paso_40	1.03%	1.40%	1.59%	1.74%	1.45%	0.61%	0.99%	0.67%	0.73%	1.17%	1.66%	1.44%
MEPSFargo_60	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MEPSFresno_Sacramento_72	0.16%	0.22%	0.25%	0.27%	0.23%	0.10%	0.15%	0.10%	0.11%	0.18%	0.26%	0.22%
MEPSFt_Jackson_24	0.51%	0.70%	0.79%	0.86%	0.72%	0.30%	0.49%	0.33%	0.36%	0.58%	0.82%	0.71%
MEPSHarrisburg_06	0.46%	0.63%	0.71%	0.78%	0.65%	0.27%	0.44%	0.30%	0.32%	0.52%	0.74%	0.64%
MEPSHonolulu_73	0.25%	0.34%	0.38%	0.42%	0.35%	0.15%	0.24%	0.16%	0.17%	0.28%	0.40%	0.35%
MEPSHouston_41	0.63%	0.86%	0.98%	1.07%	0.89%	0.38%	0.61%	0.41%	0.45%	0.71%	1.02%	0.88%
MEPSIndianapolis_61	0.51%	0.70%	0.79%	0.86%	0.72%	0.30%	0.49%	0.33%	0.36%	0.58%	0.83%	0.72%
MEPSJackson_42	0.13%	0.18%	0.20%	0.22%	0.18%	0.08%	0.13%	0.08%	0.09%	0.15%	0.21%	0.18%
MEPSJacksonville_25	0.49%	0.67%	0.76%	0.82%	0.69%	0.29%	0.47%	0.32%	0.34%	0.55%	0.79%	0.68%
MEPSKansas_City_43	0.40%	0.54%	0.61%	0.67%	0.56%	0.24%	0.38%	0.26%	0.28%	0.45%	0.64%	0.56%
MEPSKnoxville_26	0.57%	0.77%	0.88%	0.96%	0.80%	0.34%	0.55%	0.37%	0.40%	0.64%	0.92%	0.79%
MEPSLittle_Rock_44	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MEPSLos_Angeles_74	0.56%	0.76%	0.87%	0.95%	0.79%	0.33%	0.54%	0.37%	0.40%	0.63%	0.91%	0.78%
MEPSLouisville_27	0.33%	0.45%	0.51%	0.55%	0.46%	0.19%	0.31%	0.21%	0.23%	0.37%	0.53%	0.46%
MEPSMemphis_45	0.65%	0.89%	1.01%	1.10%	0.91%	0.39%	0.63%	0.43%	0.46%	0.74%	1.05%	0.91%
MEPSMiami_23	1.01%	1.38%	1.57%	1.71%	1.42%	0.60%	0.98%	0.66%	0.72%	1.15%	1.63%	1.42%
MEPSMilwaukee_62	0.45%	0.62%	0.70%	0.76%	0.64%	0.27%	0.44%	0.30%	0.32%	0.51%	0.73%	0.63%
MEPSMinneapolis_63	0.23%	0.31%	0.35%	0.38%	0.32%	0.13%	0.22%	0.15%	0.16%	0.26%	0.37%	0.32%
MEPSMontgomery_28	0.44%	0.60%	0.68%	0.74%	0.62%	0.26%	0.42%	0.29%	0.31%	0.50%	0.71%	0.62%
MEPSNashville_29	0.46%	0.64%	0.72%	0.79%	0.66%	0.28%	0.45%	0.30%	0.33%	0.53%	0.75%	0.65%
MEPSNew_Orleans_46	0.69%	0.94%	1.07%	1.17%	0.97%	0.41%	0.67%	0.45%	0.49%	0.78%	1.12%	0.97%
MEPSNew_York_City_05	0.84%	1.15%	1.30%	1.42%	1.18%	0.50%	0.81%	0.55%	0.60%	0.95%	1.36%	1.18%
MEPSOakland_75	0.58%	0.79%	0.90%	0.98%	0.82%	0.35%	0.56%	0.38%	0.41%	0.66%	0.94%	0.81%
MEPSOklahoma_City_47	0.57%	0.78%	0.88%	0.96%	0.80%	0.34%	0.55%	0.37%	0.40%	0.65%	0.92%	0.80%
MEPSOmaha_64	0.58%	0.79%	0.89%	0.98%	0.81%	0.34%	0.56%	0.38%	0.41%	0.65%	0.93%	0.81%
MEPSPhiladelphia_10	1.47%	2.00%	2.26%	2.47%	2.06%	0.88%	1.41%	0.96%	1.04%	1.66%	2.36%	2.05%
MEPSPhoenix_76	0.59%	0.80%	0.91%	0.99%	0.83%	0.35%	0.56%	0.38%	0.41%	0.66%	0.95%	0.82%
MEPSPittsburgh_11	0.64%	0.88%	1.00%	1.09%	0.91%	0.38%	0.62%	0.42%	0.46%	0.73%	1.04%	0.90%
MEPSPortland_ME_12	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MEPSPortland_OR_77	0.23%	0.31%	0.35%	0.38%	0.32%	0.13%	0.22%	0.15%	0.16%	0.26%	0.37%	0.32%
MEPSRaleigh_31	0.27%	0.37%	0.42%	0.46%	0.38%	0.16%	0.26%	0.18%	0.19%	0.31%	0.44%	0.38%
MEPSRichmond_32	0.32%	0.44%	0.50%	0.54%	0.45%	0.19%	0.31%	0.21%	0.23%	0.36%	0.52%	0.45%
MEPSSalt_Lake_City_78	0.61%	0.83%	0.94%	1.03%	0.86%	0.36%	0.59%	0.40%	0.43%	0.69%	0.98%	0.85%
MEPSSan_Antonio_48	0.65%	0.89%	1.01%	1.11%	0.92%	0.39%	0.63%	0.43%	0.46%	0.74%	1.06%	0.92%
MEPSSan_Diego_67	0.35%	0.47%	0.54%	0.59%	0.49%	0.21%	0.33%	0.23%	0.25%	0.39%	0.56%	0.49%
MEPSSan_Juan_PR_30	1.26%	1.71%	1.94%	2.11%	1.76%	0.75%	1.21%	0.82%	0.89%	1.42%	2.02%	1.76%
MEPSSeattle_79	0.27%	0.36%	0.41%	0.45%	0.37%	0.16%	0.26%	0.17%	0.19%	0.30%	0.43%	0.37%
MEPSShreveport_49	0.41%	0.56%	0.64%	0.69%	0.58%	0.24%	0.39%	0.27%	0.29%	0.46%	0.66%	0.57%
MEPSSioux_Falls_65	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MEPSSpokane_80	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MEPSSpring_Field_13	1.05%	1.43%	1.63%	1.77%	1.48%	0.63%	1.01%	0.69%	0.75%	1.19%	1.70%	1.47%
MEPSSt_Louis_66	0.58%	0.79%	0.89%	0.97%	0.81%	0.34%	0.56%	0.38%	0.41%	0.65%	0.93%	0.81%
MEPSSyracuse_14	0.10%	0.14%	0.16%	0.18%	0.15%	0.06%	0.10%	0.07%	0.07%	0.12%	0.17%	0.15%
MEPSTampa_17	0.77%	1.05%	1.19%	1.30%	1.09%	0.46%	0.74%	0.51%	0.55%	0.87%	1.25%	1.08%

APPENDIX H. COST ESTIMATION

This appendix describes the author's assumptions to estimate separation costs from RTC. The author's cost estimation is discussed in Chapter IV. The author interviewed personnel at RTC during May 1997 to get his estimates. The author used the Navy standard composite pay rates in determining staff costs.

Medical exams and immunizations are given to every recruit processed at RTC prior identification for separation from the Navy. The following cost table was supplied to the author in September 1997 by LT David C. Gerteisen.

Test	Marginal Cost	Total Including Labor		
ABO/rh	$0.50	$3.50		
RPR	$0.20	$3.50		
G-6PD	$0.70	$5.00		
Sickle Cell	$0.70	$5.00		
Lipid Panel	$0.96	$12.15		
Glucose	$0.32	$4.05	Total	
Varicella Zoster	$1.56	$8.60	$41.80	
				Marginal Cost per Male Recruit
Male	Leukocyte Esterase	$0.55	$5.05	**$46.85**
Female	GC/CHLA	$4.73	$8.40	
	b-hCG	$1.80	$6.16	
	PAP	$12.50	$25.50	**Marginal Cost per Female Recruit**
		Total	$40.06	**$81.86**

Dental marginal costs were determined by adding the cost of materials, e.g. X-ray film, and staff hours. These estimates were made by the Commanding Officer of the Naval Dental Clinic Great Lakes, CDR. Winegard on May 30 1997. Marginal costs per

recruit were determined by taking total costs and dividing by the number of recruits seen in 1997.

	Recruits: 48203			Total	Marginal Total
Record Materials	Quantity	$9.35			$9.35
X ray lab optar		$122,430			$2.54
Record Assy			Day Fraction		
E4	1	$31,956	1	$31,956	$0.66
X ray Staff					
E1	1	$21,547	0.75	$16,160	
E3	7	$186,074	0.75	$139,556	
E4	4	$127,824	0.75	$95,868	
			Staff Total	$283,540	$5.88
			Marginal Cost per Recruit		**$18.44**

Berthing costs were estimated by the NTC Comptroller Rick Campbell on 29 May 1997. Marginal costs were determined by dividing the total cost to maintain "seps division" by the 1825 recruits who stayed there in FY96. These costs are listed in the table below.

Square Footage	Utilities per sqft	Maintenance Real Property per sqft	BQ support per sqft	Total	**Marginal Cost per Recruit**
8700	$2.82	$1.20	$1.15	$44,979	$24.65

While staying in "seps division", recruits are supervised around the clock. Staff levels were supplied by the "seps division" company officer Ltjg Bredlau in May 1997. These costs, which are summarized in the following table, were divided by 1825 recruits to get the marginal cost.

Staff	Quantity	Cost	
E7	1	$52,589	
E6	5	$228,760	
E5	4	$153,152	**Marginal Cost per Recruit**
Total	10	$434,501	**$238**

Legal separation administrative costs were estimated on 29 May 1997 by the RTC legal officer LT Bartlett. The marginal cost was determined by dividing by 1825 recruits.

Optar	Fraction		Fractional Optar Cost	
$23,000	1/9		$2,556	
Staff	Quantity	Annual Cost	Day Fraction	Annual Cost
O3	1	$77,278	1/8	$9,660
E7	1	$52,589	1/3	$17,530
E6	1	$45,752	1/3	$15,251
E5	2	$76,576	1/3	$25,525
E4	3	$95,868	1/3	$31,956
Total	8	$348,063		$99,921
Staff	Optar		**Marginal Cost per Recruit**	
$99,921	$2,556		**$56**	

APPENDIX I. OPTIMAL TESTING POLICIES WHICH VARY BY CITY AND MONTH

This appendix contains the output of the Microsoft Excel spreadsheet optimization model discussed in Chapter V. Each of the scenarios was run during model sensitivity analysis. Specifically this appendix contains the runs summarized on Table 8 in Chapter VI. There are three testing options for each MEPS. No testing is represented by a "-"; single drug, THC, testing is represented by an "S"; and multiple drug testing is represented by a "M".

Kit	Cost	fnr (tbc)	fnr (c&m)	fpr	Retest Cost		Fixed Costs	
Single	$5	0.01	N/A	0.01	$50		Berthing	$44,979
Multi	$20	0.01	0.01	0.01			Supervision	$434,501
Grand Total	No Testing	Savings					MOT	$470,213
$1,638,304	$3,060,186	$1,421,881					Total	$949,693

MEPS	October	November	December	January	February	March	April	May	June	July	August	September	Best	No Testing	THC Only	All Drugs
Albany (01)	S	S	S	S	S	S	S	S	S	S	S	S	$7,763	$21,544	$7,763	$12,281
Albuquerque(36)	S	S	S	S	S	S	S	S	S	S	S	S	$3,609	$10,098	$3,609	$6,185
Amarillo(37)	S	S	S	S	S	S	S	S	S	S	S	S	$1,682	$6,176	$1,682	$5,416
Anchorage(81)	S	S	S	S	S	S	S	S	S	S	S	S	$1,568	$4,378	$1,568	$2,564
Atlanta(20)	S	S	S	S	S	S	S	S	S	S	S	S	$15,499	$45,363	$15,499	$22,605
Baltimore(02)	S	S	S	S	S	S	S	S	S	S	S	S	$18,181	$59,177	$18,181	$25,159
Beckley(21)	S	S	S	S	S	S	S	S	S	S	S	S	$2,910	$24,733	$2,910	$7,724
Boise(70)	S	S	S	S	S	S	S	S	S	S	S	S	$2,406	$12,759	$2,406	$4,743
Boston(03)	S	S	S	S	S	S	S	S	S	S	S	S	$11,366	$30,287	$11,366	$16,135
Buffalo(04)	S	S	S	S	S	S	S	S	S	S	S	S	$5,305	$16,059	$5,305	$9,722
Butte(71)	S	S	S	S	S	S	S	S	S	S	S	S	$2,090	$4,462	$2,090	$4,837
Charlotte(22)	S	S	S	S	S	S	S	S	S	S	S	S	$9,620	$43,874	$9,620	$15,575
Columbus(57)	S	S	S	S	S	S	S	S	S	S	S	S	$13,533	$51,942	$13,533	$27,605
Dallas(38)	S	S	S	S	S	S	M	S	S	S	S	S	$21,861	$53,902	$21,884	$27,534
Denver(39)	S	S	S	S	S	S	S	S	S	S	S	S	$12,189	$38,931	$12,189	$22,208
Des Moines(58)	S	S	S	S	S	S	S	S	S	S	S	S	$4,716	$17,272	$4,716	$9,622
Des Plains(54)	S	S	S	S	S	S	S	S	S	S	S	S	$19,365	$58,289	$19,365	$33,837
Detroit(59)	S	S	S	S	S	S	S	S	S	S	S	S	$8,987	$39,667	$8,987	$17,013
El Paso(40)	S	M	M	S	M	M	M	M	S	S	S	S	$9,834	$21,775	$10,590	$11,300
Fargo(60)	S	S	S	S	S	S	S	S	S	S	S	S	$649	$1,948	$649	$2,148
Fort Jackson(24)	S	S	S	S	S	S	S	S	S	S	S	S	$7,638	$27,714	$7,638	$18,527
Fresno/Sacramen	S	S	S	S	S	S	S	S	S	S	S	S	$6,454	$26,263	$6,454	$9,747
Harrisburg(06)	S	S	S	S	S	S	S	S	S	S	S	S	$17,124	$54,337	$17,124	$29,530
Honolulu(73)	S	S	S	S	S	S	S	S	S	S	S	S	$1,778	$7,084	$1,778	$3,484
Houston(41)	S	S	S	S	S	S	S	S	S	S	S	S	$25,704	$63,867	$25,704	$37,879
Indianapolis(61)	S	S	S	S	S	S	S	S	S	S	S	S	$15,531	$48,872	$15,531	$26,825
Jackson(42)	S	S	S	S	S	S	S	S	S	S	S	S	$3,062	$13,523	$3,062	$7,619
Jacksonville(25)	S	S	S	S	S	S	S	S	S	S	S	S	$19,151	$71,653	$19,151	$30,675
Kansas City(43)	S	S	S	S	S	S	S	S	S	S	S	S	$10,364	$38,424	$10,364	$19,227
Knoxville(26)	S	S	S	S	S	S	S	S	S	S	S	S	$5,316	$19,891	$5,316	$7,907
Little Rock(44)	S	S	S	S	S	S	S	S	S	S	S	S	$2,992	$14,705	$2,992	$8,946
Los Angeles(74)	S	S	S	S	S	S	S	S	S	S	S	S	$30,681	$88,242	$30,681	$46,373
Louisville(27)	S	S	S	S	S	S	S	S	S	S	S	S	$4,781	$21,651	$4,781	$9,205
Memphis(45)	S	S	S	S	S	S	S	S	S	S	S	S	$7,501	$25,774	$7,501	$11,240
Miami(23)	S	M	M	S	M	M	M	M	S	S	S	S	$13,409	$33,524	$13,916	$15,512
Milwaukee(62)	S	S	S	S	S	S	S	S	S	S	S	S	$5,895	$13,089	$5,895	$10,998
Minneapolis(63)	S	S	S	S	S	S	S	S	S	S	S	S	$5,874	$19,416	$5,874	$13,382
Montgomery(28)	S	S	S	S	S	S	S	S	S	S	S	S	$15,958	$56,238	$15,958	$27,673
Nashville(29)	S	S	S	S	S	S	S	S	S	S	S	S	$6,183	$24,249	$6,183	$10,744
New Orleans(46)	S	S	S	S	S	S	S	S	S	S	S	S	$12,066	$45,048	$12,066	$17,377
New York City(0	S	S	S	S	S	S	M	S	S	S	S	S	$41,307	$120,811	$41,315	$51,134
Oakland(75)	S	S	S	S	S	S	S	S	S	S	S	S	$31,790	$99,312	$31,790	$42,777
Oklahoma City(4	S	S	S	S	S	S	S	S	S	S	S	S	$11,574	$48,078	$11,574	$17,822
Omaha(64)	S	S	S	S	S	S	S	S	S	S	S	S	$4,383	$14,821	$4,383	$7,002
Philadelphia(10)	M	M	M	M	M	M	M	M	S	S	S	S	$17,168	$39,756	$20,256	$18,158
Phoenix(76)	S	S	S	S	S	S	S	S	S	S	S	S	$12,922	$32,802	$12,922	$19,403
Pittsburgh(11)	S	S	S	S	S	S	S	S	S	S	S	S	$11,268	$28,618	$11,268	$16,774
Portland ME(12)	S	S	S	S	S	S	S	S	S	S	S	S	$3,088	$17,863	$3,088	$9,012
Portland OR(77)	S	S	S	S	S	S	S	S	S	S	S	S	$7,745	$27,938	$7,745	$16,535
Puerto Rico(30)	S	S	S	S	S	S	S	S	S	S	S	S	$2,188	$12,322	$2,188	$4,010
Raleigh(31)	S	S	S	S	S	S	S	S	S	S	S	S	$9,557	$36,647	$9,557	$18,591
Richmond(32)	S	S	S	S	S	S	S	S	S	S	S	S	$19,605	$48,533	$19,605	$29,063
Salt Lake City(78	S	S	S	S	S	S	S	S	S	S	S	S	$3,967	$9,334	$3,967	$5,625
San Antonio(48)	S	S	S	S	S	S	S	S	S	S	S	S	$11,971	$29,209	$11,971	$23,185
San Diego(67)	M	M	M	S	M	M	M	M	S	S	S	S	$49,938	$88,162	$58,273	$53,620
Seattle(79)	S	S	S	S	S	S	S	S	S	S	S	S	$8,477	$21,210	$8,477	$17,941
Shreveport(49)	S	S	S	S	S	S	S	S	S	S	S	S	$5,751	$19,110	$5,751	$10,341
Sioux Falls(65)	S	S	S	S	S	S	S	S	S	S	S	S	$1,090	$4,836	$1,090	$3,354
Springfield(13)	S	S	S	S	S	S	S	S	S	S	S	S	$3,767	$17,167	$3,767	$11,640
Spokane(80)	S	M	M	S	M	M	M	M	S	S	S	S	$4,921	$11,871	$5,372	$5,476
St. Louis(66)	S	S	S	S	S	S	S	S	S	S	S	S	$16,606	$52,350	$16,606	$26,727
Syracuse(14)	S	S	S	S	S	S	S	S	S	S	S	S	$3,157	$7,148	$3,157	$8,787
Tampa(17)	S	S	S	S	S	S	M	S	S	S	S	S	$15,774	$46,392	$15,781	$20,339
												Total	$688,611	$2,110,492	$701,787	$1,084,398

Kit	Cost	fnr (thc)	fnr (c&m)	fpr	Retest Cost
Single	$5	0.05	N/A	0.05	$50
Multi	$20	0.05	0.05	0.05	

Grand Total	No Testing	Savings
$1,802,718	$3,060,186	$1,257,468

Fixed Costs	Password = nidt
Berthing	$44,979
Supervision	$434,501
MOT	$470,213
Total	$949,693

MEPS	October	November	December	January	February	March	April	May	June	July	August	September	Best	No Testing	THC Only	All Drugs
Albany (01)	S	S	S	S	S	S	S	S	S	S	S	S	$9,526	$21,544	$9,526	$14,191
Albuquerque(36)	S	S	S	S	S	S	S	S	S	S	S	S	$4,487	$10,098	$4,487	$7,127
Amarillo(37)	S	S	S	S	S	S	S	S	S	S	S	S	$2,417	$6,176	$2,417	$6,151
Anchorage(81)	S	S	S	S	S	S	S	S	S	S	S	S	$1,939	$4,378	$1,939	$2,966
Atlanta(20)	S	S	S	S	S	S	S	S	S	S	S	S	$18,885	$45,363	$18,885	$26,299
Baltimore(02)	S	S	S	S	S	S	S	S	S	S	S	S	$22,206	$59,177	$22,206	$29,548
Beckley(21)	S	S	S	S	S	S	S	S	S	S	S	S	$4,505	$24,733	$4,505	$9,319
Boise(70)	S	S	S	S	S	S	S	S	S	S	S	S	$3,280	$12,759	$3,280	$5,647
Boston(03)	S	S	S	S	S	S	S	S	S	S	S	S	$13,706	$30,287	$13,706	$18,712
Buffalo(04)	S	S	S	S	S	S	S	S	S	S	S	S	$6,697	$16,059	$6,697	$11,197
Butte(71)	S	S	S	S	S	S	S	S	S	S	S	S	$2,688	$4,462	$2,688	$5,461
Charlotte(22)	S	S	S	S	S	S	S	S	S	S	S	S	$12,444	$43,874	$12,444	$18,551
Columbus(57)	S	S	S	S	S	S	S	S	S	S	S	S	$17,789	$51,942	$17,789	$32,030
Dallas(38)	S	S	S	S	S	S	S	S	S	S	S	S	$25,853	$53,902	$25,853	$32,005
Denver(39)	S	S	S	S	S	S	S	S	S	S	S	S	$15,436	$38,931	$15,436	$25,641
Des Moines(58)	S	S	S	S	S	S	S	S	S	S	S	S	$6,161	$17,272	$6,161	$11,124
Des Plains(54)	S	S	S	S	S	S	S	S	S	S	S	S	$24,206	$58,289	$24,206	$38,985
Detroit(59)	S	S	S	S	S	S	S	S	S	S	S	S	$11,816	$39,667	$11,816	$19,951
El Paso(40)	S	M	M	S	M	M	M	M	S	S	S	S	$11,554	$21,775	$12,151	$13,134
Fargo(60)	S	S	S	S	S	S	S	S	S	S	S	S	$924	$1,948	$924	$2,423
Fort Jackson(24)	S	S	S	S	S	S	S	S	S	S	S	S	$10,303	$27,714	$10,303	$21,257
Fresno/Sacrament	S	S	S	S	S	S	S	S	S	S	S	S	$8,172	$26,263	$8,172	$11,582
Harrisburg(06)	S	S	S	S	S	S	S	S	S	S	S	S	$21,517	$54,337	$21,517	$34,209
Honolulu(73)	S	S	S	S	S	S	S	S	S	S	S	S	$2,336	$7,084	$2,336	$4,068
Houston(41)	S	S	S	S	S	S	S	S	S	S	S	S	$30,982	$63,867	$30,982	$43,683
Indianapolis(61)	S	S	S	S	S	S	S	S	S	S	S	S	$19,474	$48,872	$19,474	$31,019
Jackson(42)	S	S	S	S	S	S	S	S	S	S	S	S	$4,232	$13,523	$4,232	$8,808
Jacksonville(25)	S	S	S	S	S	S	S	S	S	S	S	S	$24,208	$71,653	$24,208	$36,067
Kansas City(43)	S	S	S	S	S	S	S	S	S	S	S	S	$13,340	$38,424	$13,340	$22,347
Knoxville(26)	S	S	S	S	S	S	S	S	S	S	S	S	$6,656	$19,891	$6,656	$9,347
Little Rock(44)	S	S	S	S	S	S	S	S	S	S	S	S	$4,348	$14,705	$4,348	$10,302
Los Angeles(74)	S	S	S	S	S	S	S	S	S	S	S	S	$37,545	$88,242	$37,545	$53,840
Louisville(27)	S	S	S	S	S	S	S	S	S	S	S	S	$6,331	$21,651	$6,331	$10,814
Memphis(45)	S	S	S	S	S	S	S	S	S	S	S	S	$9,304	$25,774	$9,304	$13,182
Miami(23)	S	M	M	S	S	M	M	M	S	S	S	S	$15,870	$33,524	$16,199	$18,138
Milwaukee(62)	S	S	S	S	S	S	S	S	S	S	S	S	$7,295	$13,089	$7,295	$12,494
Minneapolis(63)	S	S	S	S	S	S	S	S	S	S	S	S	$7,752	$19,416	$7,752	$15,320
Montgomery(28)	S	S	S	S	S	S	S	S	S	S	S	S	$20,257	$56,238	$20,257	$32,227
Nashville(29)	S	S	S	S	S	S	S	S	S	S	S	S	$7,928	$24,249	$7,928	$12,582
New Orleans(46)	S	S	S	S	S	S	S	S	S	S	S	S	$15,018	$45,048	$15,018	$20,556
New York City(0	S	S	S	S	S	S	S	S	S	S	S	S	$49,360	$120,811	$49,360	$60,100
Oakland(75)	S	S	S	S	S	S	S	S	S	S	S	S	$38,674	$99,312	$38,674	$50,350
Oklahoma City(4	S	S	S	S	S	S	S	S	S	S	S	S	$14,695	$48,078	$14,695	$21,141
Omaha(64)	S	S	S	S	S	S	S	S	S	S	S	S	$5,473	$14,821	$5,473	$8,169
Philadelphia(10)	M	M	M	S	M	M	M	M	S	S	S	S	$20,111	$39,756	$22,777	$21,237
Phoenix(76)	S	S	S	S	S	S	S	S	S	S	S	S	$15,646	$32,802	$15,646	$22,388
Pittsburgh(11)	S	S	S	S	S	S	S	S	S	S	S	S	$13,615	$28,618	$13,615	$19,348
Portland ME(12)	S	S	S	S	S	S	S	S	S	S	S	S	$4,563	$17,863	$4,563	$10,487
Portland OR(77)	S	S	S	S	S	S	S	S	S	S	S	S	$10,205	$27,938	$10,205	$19,088
Puerto Rico(30)	S	S	S	S	S	S	S	S	S	S	S	S	$2,973	$12,322	$2,973	$4,823
Raleigh(31)	S	S	S	S	S	S	S	S	S	S	S	S	$12,456	$36,647	$12,456	$21,617
Richmond(32)	S	S	S	S	S	S	S	S	S	S	S	S	$23,652	$48,533	$23,652	$33,512
Salt Lake City(78	S	S	S	S	S	S	S	S	S	S	S	S	$4,742	$9,334	$4,742	$6,485
San Antonio(48)	S	S	S	S	S	S	S	S	S	S	S	S	$15,017	$29,209	$15,017	$26,417
San Diego(67)	M	M	M	S	M	M	M	M	S	S	S	S	$57,664	$88,162	$64,807	$61,795
Seattle(79)	S	S	S	S	S	S	S	S	S	S	S	S	$10,821	$21,210	$10,821	$20,401
Shreveport(49)	S	S	S	S	S	S	S	S	S	S	S	S	$7,306	$19,110	$7,306	$11,987
Sioux Falls(65)	S	S	S	S	S	S	S	S	S	S	S	S	$1,577	$4,836	$1,577	$3,841
Springfield(13)	S	S	S	S	S	S	S	S	S	S	S	S	$5,475	$17,167	$5,475	$13,348
Spokane(80)	S	M	M	S	M	M	M	M	S	S	S	S	$5,800	$11,871	$6,166	$6,410
St. Louis(66)	S	S	S	S	S	S	S	S	S	S	S	S	$20,613	$52,350	$20,613	$31,024
Syracuse(14)	S	S	S	S	S	S	S	S	S	S	S	S	$4,229	$7,148	$4,229	$9,880
Tampa(17)	S	S	S	S	S	S	S	S	S	S	S	S	$18,969	$46,392	$18,969	$23,874
												Total	**$853,025**	**$2,110,492**	**$864,126**	**$1,260,030**

Kit	Cost	fnr (thc)	fnr (c&m)	fpr	Retest Cost		Fixed Costs	Password = nidt								
Single	$5	0.25	N/A	0.25	$50		Berthing	$44,979								
Multi	$20	0.25	0.25	0.25			Supervision	$434,501								
Grand Total	No Testing	Savings					MOT	$470,213								
$2,593,039	$3,060,186	$467,146					Total	$949,693								
MEPS	October	November	December	January	February	March	April	May	June	July	August	September	Best	No Testing	THC Only	All Drugs
Albany (01)	S	S	S	S	S	S	S	S	S	-	S	S	$18,060	$21,544	$18,344	$23,741
Albuquerque(36)	S	S	S	S	S	S	S	S	-	-	S	-	$8,724	$10,098	$8,876	$11,835
Amarillo(37)	S	S	S	S	S	S	S	-	-	-	-	-	$5,626	$6,176	$6,092	$9,826
Anchorage(81)	S	S	S	S	S	S	S	S	-	-	S	-	$3,763	$4,378	$3,796	$4,973
Atlanta(20)	S	S	S	S	S	S	S	S	S	-	S	S	$35,701	$45,363	$35,819	$44,769
Baltimore(02)	S	S	S	S	S	S	S	S	S	S	S	S	$42,333	$59,177	$42,333	$51,495
Beckley(21)	S	S	S	S	S	S	S	S	S	S	S	S	$12,481	$24,733	$12,481	$17,295
Boise(70)	S	S	S	S	S	S	S	S	S	S	S	S	$7,649	$12,759	$7,649	$10,165
Boston(03)	S	S	S	S	S	S	S	S	S	-	S	S	$25,066	$30,287	$25,406	$31,597
Buffalo(04)	S	S	S	S	S	S	S	S	S	-	S	S	$13,474	$16,059	$13,659	$18,572
Butte(71)	-	-	-	-	-	-	-	-	-	-	-	-	$4,462	$4,462	$5,679	$8,582
Charlotte(22)	S	S	S	S	S	S	S	S	S	S	S	S	$26,564	$43,874	$26,564	$33,432
Columbus(57)	S	S	S	S	S	S	S	S	S	-	S	S	$38,768	$51,942	$39,071	$54,157
Dallas(38)	S	S	S	S	S	S	S	S	S	-	S	S	$45,194	$53,902	$45,699	$54,358
Denver(39)	S	S	S	S	S	S	S	S	S	-	S	S	$31,386	$38,931	$31,672	$42,808
Des Moines(58)	S	S	S	S	S	S	S	S	S	-	S	S	$13,288	$17,272	$13,386	$18,638
Des Plains(54)	S	S	S	S	S	S	S	S	S	-	S	S	$47,763	$58,289	$48,414	$64,727
Detroit(59)	S	S	S	S	S	S	S	S	S	S	S	S	$25,958	$39,667	$25,958	$34,638
El Paso(40)	S	M	S	S	S	S	M	S	-	-	S	-	$19,655	$21,775	$19,955	$22,307
Fargo(60)	S	S	-	-	S	S	S	-	-	-	-	-	$1,924	$1,948	$2,297	$3,797
Fort Jackson(24)	S	S	S	S	S	S	S	S	S	-	S	S	$23,396	$27,714	$23,625	$34,906
Fresno/Sacrament	S	S	S	S	S	S	S	S	S	S	S	S	$16,763	$26,263	$16,763	$20,759
Harrisburg(06)	S	S	S	S	S	S	S	S	S	-	S	S	$42,933	$54,337	$43,479	$57,604
Honolulu(73)	S	S	S	S	S	S	S	S	S	-	S	S	$5,118	$7,084	$5,131	$6,987
Houston(41)	S	S	S	S	S	S	S	S	-	-	S	-	$56,330	$63,867	$57,369	$72,705
Indianapolis(61)	S	S	S	S	S	S	S	S	S	-	S	S	$38,724	$48,872	$39,187	$51,990
Jackson(42)	S	S	S	S	S	S	S	S	S	-	S	S	$10,015	$13,523	$10,078	$14,752
Jacksonville(25)	S	S	S	S	S	S	S	S	S	S	S	S	$49,492	$71,653	$49,492	$63,026
Kansas City(43)	S	S	S	S	S	S	S	S	S	-	S	S	$28,128	$38,424	$28,220	$37,948
Knoxville(26)	S	S	S	S	S	S	S	S	S	S	S	S	$13,356	$19,891	$13,356	$16,548
Little Rock(44)	S	S	S	S	S	S	S	S	S	-	S	S	$11,047	$14,705	$11,125	$17,079
Los Angeles(74)	S	S	S	S	S	S	S	S	S	-	S	S	$71,207	$88,242	$71,862	$91,176
Louisville(27)	S	S	S	S	S	S	S	S	S	S	S	S	$14,084	$21,651	$14,084	$18,857
Memphis(45)	S	S	S	S	S	S	S	S	S	S	S	S	$18,318	$25,774	$18,318	$22,892
Miami(23)	S	S	S	S	S	S	S	S	S	-	S	S	$27,408	$33,524	$27,616	$31,265
Milwaukee(62)	S	S	-	-	S	S	S	-	-	-	-	-	$12,825	$13,089	$14,292	$19,973
Minneapolis(63)	S	S	S	S	S	S	S	S	-	-	S	-	$16,734	$19,416	$17,144	$25,010
Montgomery(28)	S	S	S	S	S	S	S	S	S	-	S	S	$41,548	$56,238	$41,750	$54,995
Nashville(29)	S	S	S	S	S	S	S	S	S	S	S	S	$16,656	$24,249	$16,656	$21,773
New Orleans(46)	S	S	S	S	S	S	S	S	S	S	S	S	$29,782	$45,048	$29,782	$36,456
New York City(0	S	S	S	S	S	S	S	S	S	-	S	S	$89,452	$120,811	$89,587	$104,934
Oakland(75)	S	S	S	S	S	S	S	S	S	-	S	S	$72,977	$99,312	$73,093	$88,216
Oklahoma City(4	S	S	S	S	S	S	S	S	S	S	S	S	$30,303	$48,078	$30,303	$37,732
Omaha(64)	S	S	S	S	S	S	S	S	S	-	S	S	$10,912	$14,821	$10,927	$14,005
Philadelphia(10)	S	M	M	S	M	M	M	M	S	-	S	S	$34,199	$39,756	$35,383	$36,630
Phoenix(76)	S	S	S	S	S	S	S	S	-	-	S	-	$28,750	$32,802	$29,262	$37,313
Pittsburgh(11)	S	S	S	S	S	S	S	S	-	-	S	-	$24,869	$28,618	$25,354	$32,219
Portland ME(12)	S	S	S	S	S	S	S	S	S	-	S	S	$11,930	$17,863	$11,937	$17,861
Portland OR(77)	S	S	S	S	S	S	S	S	S	-	S	S	$22,256	$27,938	$22,507	$31,857
Puerto Rico(30)	S	S	S	S	S	S	S	S	S	S	S	S	$6,898	$12,322	$6,898	$8,893
Raleigh(31)	S	S	S	S	S	S	S	S	S	-	S	S	$26,809	$36,647	$26,951	$36,748
Richmond(32)	S	S	S	S	S	S	S	S	-	-	S	-	$43,019	$48,533	$43,885	$55,759
Salt Lake City(78	S	S	S	S	S	S	S	-	-	-	-	-	$8,410	$9,334	$8,615	$10,784
San Antonio(48)	S	S	S	S	S	S	S	-	-	-	-	-	$27,969	$29,209	$30,243	$42,582
San Diego(67)	-	M	-	-	S	M	M	-	-	-	-	-	$87,449	$88,162	$97,479	$102,670
Seattle(79)	S	S	-	S	S	S	S	-	-	-	-	-	$20,497	$21,210	$22,537	$32,700
Shreveport(49)	S	S	S	S	S	S	S	S	S	-	S	S	$14,924	$19,110	$15,083	$20,222
Sioux Falls(65)	S	S	S	S	S	S	S	S	S	-	S	S	$3,944	$4,836	$4,011	$6,276
Springfield(13)	S	S	S	S	S	S	S	S	S	-	S	S	$13,697	$17,167	$14,016	$21,889
Spokane(80)	S	M	S	S	S	M	M	S	S	-	S	S	$10,010	$11,871	$10,134	$11,082
St. Louis(66)	S	S	S	S	S	S	S	S	S	-	S	S	$40,387	$52,350	$40,645	$52,505
Syracuse(14)	-	-	-	-	-	-	-	-	-	-	-	-	$7,148	$7,148	$9,591	$15,347
Tampa(17)	S	S	S	S	S	S	S	S	S	-	S	S	$34,838	$46,392	$34,909	$41,554
												Total	$1,643,346	$2,110,492	$1,675,824	$2,138,190

Kit	Cost	for (thc)	fnr (c&m)	fpr	Retest Cost
Single	$5	0.01	N/A	0.01	$50
Multi	$10	0.01	0.01	0.01	

Grand Total	No Testing	Savings
$1,521,732	$3,060,186	$1,538,454

Fixed Costs	Password = nidt
Berthing	$44,979
Supervision	$434,501
MOT	$470,213
Total	$949,693

MEPS	October	November	December	January	February	March	April	May	June	July	August	September	Best	No Testing	THC Only	All Drugs
Albany (01)	M	M	M	M	M	M	M	M	S	M	S	S	$6,681	$21,544	$7,763	$6,851
Albuquerque(36)	M	M	M	S	M	M	M	M	S	S	S	S	$3,277	$10,098	$3,609	$3,415
Amarillo(37)	S	S	S	S	S	S	S	S	S	S	S	S	$1,682	$6,176	$1,682	$2,926
Anchorage(81)	M	M	M	M	M	M	M	M	S	M	S	S	$1,358	$4,378	$1,568	$1,404
Atlanta(20)	M	M	M	M	M	M	M	M	S	M	S	S	$12,650	$45,363	$15,499	$12,795
Baltimore(02)	M	M	M	M	M	M	M	M	S	M	S	M	$14,442	$59,177	$18,181	$14,499
Beckley(21)	S	S	S	S	S	S	S	S	S	S	S	S	$2,910	$24,733	$2,910	$4,514
Boise(70)	S	M	S	S	S	S	M	S	S	S	S	S	$2,401	$12,759	$2,406	$2,693
Boston(03)	M	M	M	M	M	M	M	M	S	M	S	M	$9,000	$30,287	$11,366	$9,045
Buffalo(04)	S	M	M	S	M	M	M	M	S	S	S	S	$5,064	$16,059	$5,305	$5,412
Butte(71)	S	S	S	S	S	S	S	S	S	S	S	S	$2,090	$4,462	$2,090	$2,577
Charlotte(22)	M	M	M	M	M	M	M	M	S	M	S	S	$8,756	$43,874	$9,620	$9,095
Columbus(57)	S	M	S	S	S	S	M	S	S	S	S	S	$13,498	$51,942	$13,533	$15,435
Dallas(38)	M	M	M	M	M	M	M	M	M	M	M	M	$15,494	$53,902	$21,884	$15,494
Denver(39)	S	M	M	S	M	M	M	M	S	S	S	S	$11,636	$38,931	$12,189	$12,458
Des Moines(58)	S	M	S	S	S	S	M	S	S	S	S	S	$4,706	$17,272	$4,716	$5,402
Des Plains(54)	M	M	M	S	M	M	M	M	S	S	S	S	$18,136	$58,289	$19,365	$19,127
Detroit(59)	S	M	S	S	S	M	M	S	S	S	S	S	$8,919	$39,667	$8,987	$9,863
El Paso(40)	M	M	M	M	M	M	M	M	M	M	M	M	$6,310	$21,775	$10,590	$6,310
Fargo(60)	S	S	S	S	S	S	S	S	S	S	S	S	$649	$1,948	$649	$1,148
Fort Jackson(24)	S	S	S	S	S	S	S	S	S	S	S	S	$7,638	$27,714	$7,638	$10,187
Fresno/Sacrament	M	M	M	M	M	M	M	M	S	M	S	S	$5,497	$26,263	$6,454	$5,617
Harrisburg(06)	M	M	M	S	M	M	M	M	S	S	S	S	$15,786	$54,337	$17,124	$16,530
Honolulu(73)	S	M	S	S	S	M	M	S	S	S	S	S	$1,752	$7,084	$1,778	$1,934
Houston(41)	M	M	M	M	M	M	M	M	S	M	S	S	$20,804	$63,867	$25,704	$21,069
Indianapolis(61)	M	M	M	S	M	M	M	M	S	S	S	S	$14,401	$48,872	$15,531	$15,145
Jackson(42)	S	S	S	S	S	S	S	S	S	S	S	S	$3,062	$13,523	$3,062	$4,259
Jacksonville(25)	M	M	M	M	M	M	M	M	S	M	S	S	$16,918	$71,653	$19,151	$17,465
Kansas City(43)	S	M	M	S	M	M	M	M	S	S	S	S	$10,080	$38,424	$10,364	$10,937
Knoxville(26)	M	M	M	M	M	M	M	M	S	M	S	S	$4,454	$19,891	$5,316	$4,527
Little Rock(44)	S	S	S	S	S	S	S	S	S	S	S	S	$2,992	$14,705	$2,992	$4,976
Los Angeles(74)	M	M	M	M	M	M	M	M	S	M	S	S	$25,457	$88,242	$30,681	$25,953
Louisville(27)	S	M	S	S	S	M	M	S	S	S	S	S	$4,748	$21,651	$4,781	$5,295
Memphis(45)	M	M	M	M	M	M	M	M	S	M	S	S	$6,330	$25,774	$7,501	$6,450
Miami(23)	M	M	M	M	M	M	M	M	M	M	M	M	$8,802	$33,524	$13,916	$8,802
Milwaukee(62)	S	M	M	S	M	M	M	M	S	S	S	S	$5,588	$13,089	$5,895	$6,008
Minneapolis(63)	S	S	S	S	S	S	S	S	S	S	S	S	$5,874	$19,416	$5,874	$7,392
Montgomery(28)	M	M	M	S	M	M	M	M	S	S	S	S	$14,896	$56,238	$15,958	$15,653
Nashville(29)	M	M	M	S	M	M	M	M	S	S	S	S	$5,821	$24,249	$6,183	$6,174
New Orleans(46)	M	M	M	M	M	M	M	M	S	M	S	M	$10,010	$45,048	$12,066	$10,087
New York City(0	M	M	M	M	M	M	M	M	M	M	M	M	$29,384	$120,811	$41,315	$29,384
Oakland(75)	M	M	M	M	M	M	M	M	S	M	M	M	$24,013	$99,312	$31,790	$24,077
Oklahoma City(4	M	M	M	M	M	M	M	M	S	M	S	S	$10,126	$48,078	$11,574	$10,412
Omaha(64)	M	M	M	M	M	M	M	M	S	M	S	S	$3,869	$14,821	$4,383	$3,992
Philadelphia(10)	M	M	M	M	M	M	M	M	M	M	M	M	$10,358	$39,756	$20,256	$10,358
Phoenix(76)	M	M	M	M	M	M	M	M	S	M	S	S	$10,568	$32,802	$12,922	$10,763
Pittsburgh(11)	M	M	M	M	M	M	M	M	S	M	S	S	$9,242	$28,618	$11,268	$9,364
Portland ME(12)	S	S	S	S	S	S	S	S	S	S	S	S	$3,088	$17,863	$3,088	$5,062
Portland OR(77)	S	S	S	S	S	S	S	S	S	S	S	S	$7,745	$27,938	$7,745	$9,135
Puerto Rico(30)	S	M	M	S	M	M	M	M	S	S	S	S	$2,141	$12,322	$2,188	$2,320
Raleigh(31)	S	M	S	S	S	M	M	S	S	S	S	S	$9,454	$36,647	$9,557	$10,471
Richmond(32)	M	M	M	M	M	M	M	M	S	M	S	S	$15,898	$48,533	$19,605	$16,113
Salt Lake City(78	M	M	M	M	M	M	M	M	S	M	S	M	$3,093	$9,334	$3,967	$3,115
San Antonio(48)	S	M	M	S	M	M	M	M	S	S	S	S	$11,565	$29,209	$11,971	$12,615
San Diego(67)	M	M	M	M	M	M	M	M	M	M	M	M	$29,650	$88,162	$58,273	$29,650
Seattle(79)	S	S	S	S	S	S	M	S	S	S	S	S	$8,465	$21,210	$8,477	$9,711
Shreveport(49)	M	M	M	S	M	M	M	M	S	S	S	S	$5,415	$19,110	$5,751	$5,771
Sioux Falls(65)	S	S	S	S	S	S	S	S	S	S	S	S	$1,090	$4,836	$1,090	$1,844
Springfield(13)	S	S	S	S	S	S	S	S	S	S	S	S	$3,767	$17,167	$3,767	$6,390
Spokane(80)	M	M	M	M	M	M	M	M	M	M	M	M	$3,086	$11,871	$5,372	$3,086
St. Louis(66)	M	M	M	M	M	M	M	M	S	M	S	S	$14,734	$52,350	$16,606	$15,197
Syracuse(14)	S	S	S	S	S	S	S	S	S	S	S	S	$3,157	$7,148	$3,157	$4,687
Tampa(17)	M	M	M	M	M	M	M	M	M	M	M	M	$11,559	$46,392	$15,781	$11,559
												Total	**$572,038**	**$2,110,492**	**$701,787**	**$609,998**

Kit	Cost	fnr (thc)	fnr (c&m)	fpr	Retest Cost		Fixed Costs	Password = nidt
Single	$5	0.05	N/A	0.05	$50		Berthing	$44,979
Multi	$10	0.05	0.05	0.05			Supervision	$434,501
Grand Total	No Testing	Savings					MOT	$470,213
$1,694,931	$3,060,186	$1,365,255					Total	$949,693

MEPS	October	November	December	January	February	March	April	May	June	July	August	September	Best	No Testing	THC Only	All Drugs
Albany (01)	M	M	M	M	M	M	M	M	S	M	S	S	$8,565	$21,544	$9,526	$8,761
Albuquerque(36)	M	M	M	S	M	M	M	M	S	S	S	S	$4,199	$10,098	$4,487	$4,357
Amarillo(37)	S	S	S	S	S	S	S	S	S	S	S	S	$2,417	$6,176	$2,417	$3,661
Anchorage(81)	M	M	M	M	M	M	M	M	S	S	S	S	$1,755	$4,378	$1,939	$1,806
Atlanta(20)	M	M	M	M	M	M	M	M	S	M	S	S	$16,286	$45,363	$18,885	$16,489
Baltimore(02)	M	M	M	M	M	M	M	M	S	M	S	M	$18,793	$59,177	$22,206	$18,888
Beckley(21)	S	S	S	S	S	S	S	S	S	S	S	S	$4,505	$24,733	$4,505	$6,109
Boise(70)	S	S	S	S	S	S	M	S	S	S	S	S	$3,279	$12,759	$3,280	$3,597
Boston(03)	M	M	M	M	M	M	M	M	S	M	S	M	$11,552	$30,287	$13,706	$11,622
Buffalo(04)	S	M	M	S	M	M	M	M	S	S	S	S	$6,503	$16,059	$6,697	$6,887
Butte(71)	S	S	S	S	S	S	S	S	S	S	S	S	$2,688	$4,462	$2,688	$3,201
Charlotte(22)	M	M	M	M	M	M	M	M	S	S	S	S	$11,696	$43,874	$12,444	$12,071
Columbus(57)	S	S	S	S	S	S	M	S	S	S	S	S	$17,780	$51,942	$17,789	$19,860
Dallas(38)	M	M	M	M	M	M	M	M	M	M	M	M	$19,965	$53,902	$25,853	$19,965
Denver(39)	S	M	M	S	M	M	M	M	S	S	S	S	$14,993	$38,931	$15,436	$15,891
Des Moines(58)	S	S	S	S	S	S	M	S	S	S	S	S	$6,159	$17,272	161	$6,904
Des Plains(54)	M	M	M	S	M	M	M	M	S	S	S	S	$23,182	$58,289	$24,206	$24,275
Detroit(59)	S	M	S	S	S	S	M	S	S	S	S	S	$11,783	$39,667	$11,816	$12,801
El Paso(40)	M	M	M	M	M	M	M	M	M	M	M	M	$8,144	$21,775	$12,151	$8,144
Fargo(60)	S	S	S	S	S	S	S	S	S	S	S	S	$924	$1,948	$924	$1,423
Fort Jackson(24)	S	S	S	S	S	S	S	S	S	S	S	S	$10,303	$27,714	$10,303	$12,917
Fresno/Sacrament	M	M	M	M	M	M	M	M	S	M	S	S	$7,312	$26,263	$8,172	$7,452
Harrisburg(06)	M	M	M	S	M	M	M	M	S	S	S	S	$20,356	$54,337	$21,517	$21,209
Honolulu(73)	S	M	S	S	S	M	M	S	S	S	S	S	$2,319	$7,084	$2,336	$2,518
Houston(41)	M	M	M	M	M	M	M	M	S	M	S	S	$26,530	$63,867	$30,982	$26,873
Indianapolis(61)	M	M	M	S	M	M	M	M	S	S	S	S	$18,505	$48,872	$19,474	$19,339
Jackson(42)	S	S	S	S	S	S	S	S	S	S	S	S	$4,232	$13,523	$4,232	$5,448
Jacksonville(25)	M	M	M	M	M	M	M	M	S	M	S	S	$22,248	$71,653	$24,208	$22,857
Kansas City(43)	S	M	M	S	M	M	M	M	S	S	S	S	$13,143	$38,424	$13,340	$14,057
Knoxville(26)	M	M	M	M	M	M	M	M	S	M	S	S	$5,875	$19,891	$6,656	$5,967
Little Rock(44)	S	S	S	S	S	S	S	S	S	S	S	S	$4,348	$14,705	$4,348	$6,332
Los Angeles(74)	M	M	M	M	M	M	M	M	S	M	S	S	$32,827	$88,242	$37,545	$33,420
Louisville(27)	S	M	S	S	S	M	M	S	S	S	S	S	$6,314	$21,651	$6,331	$6,904
Memphis(45)	M	M	M	M	M	M	M	M	S	M	S	S	$8,243	$25,774	$9,304	$8,392
Miami(23)	M	M	M	M	M	M	M	M	M	M	M	M	$11,428	$33,524	$16,199	$11,428
Milwaukee(62)	S	M	M	S	M	M	M	M	S	S	S	S	$7,042	$13,089	$7,295	$7,504
Minneapolis(63)	S	S	S	S	S	S	S	S	S	S	S	S	$7,752	$19,416	$7,752	$9,330
Montgomery(28)	M	M	M	S	M	M	M	M	S	S	S	S	$19,365	$56,238	$20,257	$20,207
Nashville(29)	M	M	M	S	M	M	M	M	S	S	S	S	$7,626	$24,249	$7,928	$8,012
New Orleans(46)	M	M	M	M	M	M	M	M	S	M	S	M	$13,155	$45,048	$15,018	$13,266
New York City(0	M	M	M	M	M	M	M	M	M	M	M	M	$38,350	$120,811	$49,360	$38,350
Oakland(75)	M	M	M	M	M	M	M	M	S	M	S	M	$31,539	$99,312	$38,674	$31,650
Oklahoma City(4	M	M	M	M	M	M	M	M	S	M	S	S	$13,409	$48,078	$14,695	$13,731
Omaha(64)	M	M	M	M	M	M	M	M	S	M	S	S	$5,021	$14,821	$5,473	$5,159
Philadelphia(10)	M	M	M	M	M	M	M	M	M	M	M	M	$13,437	$39,756	$22,777	$13,437
Phoenix(76)	M	M	M	M	M	M	M	M	S	M	S	S	$13,511	$32,802	$15,646	$13,748
Pittsburgh(11)	M	M	M	M	M	M	M	M	S	M	S	S	$11,781	$28,618	$13,615	$11,938
Portland ME(12)	S	S	S	S	S	S	S	S	S	S	S	S	$4,563	$17,863	$4,563	$6,537
Portland OR(77)	S	S	S	S	S	S	S	S	S	S	S	S	$10,205	$27,938	$10,205	$11,688
Puerto Rico(30)	S	M	M	S	S	M	M	M	S	S	S	S	$2,942	$12,322	$2,973	$3,133
Raleigh(31)	S	M	S	S	S	M	M	S	S	S	S	S	$12,390	$36,647	$12,456	$13,497
Richmond(32)	M	M	M	M	M	M	M	M	S	M	S	S	$20,279	$48,533	$23,652	$20,562
Salt Lake City(78	M	M	M	M	M	M	M	M	S	M	S	M	$3,943	$9,334	$4,742	$3,975
San Antonio(48)	S	M	M	S	M	M	M	M	S	S	S	S	$14,725	$29,209	$15,017	$15,847
San Diego(67)	M	M	M	M	M	M	M	M	M	M	M	M	$37,825	$88,162	$64,807	$37,825
Seattle(79)	S	S	S	S	S	S	M	S	S	S	S	S	$10,820	$21,210	$10,821	$12,171
Shreveport(49)	M	M	M	S	M	M	M	M	S	S	S	S	$7,025	$19,110	$7,306	$7,417
Sioux Falls(65)	S	S	S	S	S	S	S	S	S	S	S	S	$1,577	$4,836	$1,577	$2,331
Springfield(13)	S	S	S	S	S	S	S	S	S	S	S	S	$5,475	$17,167	$5,475	$8,098
Spokane(80)	M	M	M	M	M	M	M	M	M	M	M	M	$4,020	$11,871	$6,166	$4,020
St. Louis(66)	M	M	M	M	M	M	M	M	S	M	S	S	$18,984	$52,350	$20,613	$19,494
Syracuse(14)	S	S	S	S	S	S	S	S	S	S	S	S	$4,229	$7,148	$4,229	$5,780
Tampa(17)	M	M	M	M	M	M	M	M	M	M	M	M	$15,094	$46,392	$18,969	$15,094
												Total	**$745,237**	**$2,110,492**	**$864,126**	**$785,630**

Kit	Cost	fnr (thc)	fnr (c&m)	fpr	Retest Cost
Single	$5	0.25	N/A	0.25	$50
Multi	$10	0.25	0.25	0.25	
Grand Total	No Testing	**Savings**			
$2,533,163	$3,060,186	**$527,022**			

Fixed Costs	Password = nidt
Berthing	$44,979
Supervision	$434,501
MOT	$470,213
Total	$949,693

MEPS	October	November	December	January	February	March	April	May	June	July	August	September	Best	No Testing	THC Only	All Drugs
Albany (01)	M	M	M	S	M	M	M	M	S	-	S	S	$17,641	$21,544	$18,344	$18,311
Albuquerque(36)	S	M	M	S	M	M	M	M	-	-	S	-	$8,641	$10,098	$8,876	$9,065
Amarillo(37)	S	S	S	S	S	S	S	-	-	-	-	-	$5,626	$6,176	$6,092	$7,336
Anchorage(81)	S	M	M	S	M	M	M	M	-	-	S	-	$3,692	$4,378	$3,796	$3,813
Atlanta(20)	M	M	M	M	M	M	M	M	S	-	S	S	$34,353	$45,363	$35,819	$34,959
Baltimore(02)	M	M	M	M	M	M	M	M	S	M	S	S	$40,459	$59,177	$42,333	$40,835
Beckley(21)	S	S	S	S	S	S	S	S	S	S	S	S	$12,481	$24,733	$12,481	$14,085
Boise(70)	S	S	S	S	S	S	S	S	S	S	S	S	$7,649	$12,759	$7,649	$8,115
Boston(03)	M	M	M	M	M	M	M	M	S	-	S	S	$23,927	$30,287	$25,406	$24,507
Buffalo(04)	S	M	S	S	S	S	M	S	S	-	S	S	$13,457	$16,059	$13,659	$14,262
Butte(71)	-	-	-	-	-	-	-	-	-	-	-	-	$4,462	$4,462	$5,679	$6,322
Charlotte(22)	S	M	M	S	M	M	M	M	S	S	S	S	$26,294	$43,874	$26,564	$26,952
Columbus(57)	S	S	S	S	S	S	S	S	S	-	S	S	$38,768	$51,942	$39,071	$41,987
Dallas(38)	M	M	M	M	M	M	M	M	S	-	S	S	$41,823	$53,902	$45,699	$42,318
Denver(39)	S	M	S	S	S	S	M	S	S	-	S	S	$31,356	$38,931	$31,672	$33,058
Des Moines(58)	S	S	S	S	S	S	S	S	S	-	S	S	$13,288	$17,272	$13,386	$14,418
Des Plains(54)	S	M	S	S	S	M	M	S	S	-	S	S	$47,577	$58,289	$48,414	$50,017
Detroit(59)	S	S	S	S	S	S	S	S	S	S	S	S	$25,958	$39,667	$25,958	$27,488
El Paso(40)	M	M	M	M	M	M	M	M	M	-	M	M	$17,247	$21,775	$19,955	$17,317
Fargo(60)	S	S	-	-	S	S	S	-	-	-	-	-	$1,924	$1,948	$2,297	$2,797
Fort Jackson(24)	S	S	S	S	S	S	S	S	S	-	S	S	$23,396	$27,714	$23,625	$26,566
Fresno/Sacrament	M	M	M	S	M	M	M	M	S	S	S	S	$16,362	$26,263	$16,763	$16,629
Harrisburg(06)	S	M	M	S	M	M	M	M	S	-	S	S	$42,592	$54,337	$43,479	$44,604
Honolulu(73)	S	S	S	S	S	S	S	S	S	-	S	S	$5,118	$7,084	$5,131	$5,437
Houston(41)	M	M	M	M	M	M	M	M	-	-	S	-	$54,113	$63,867	$57,369	$55,895
Indianapolis(61)	S	M	M	S	M	M	M	M	S	-	S	S	$38,481	$48,872	$39,187	$40,310
Jackson(42)	S	S	S	S	S	S	S	S	S	-	S	S	$10,015	$13,523	$10,078	$11,392
Jacksonville(25)	S	M	M	S	M	M	M	M	S	S	S	S	$48,689	$71,653	$49,492	$49,816
Kansas City(43)	S	S	S	S	S	S	S	S	S	-	S	S	$28,128	$38,424	$28,220	$29,658
Knoxville(26)	M	M	M	M	M	M	M	M	S	S	S	S	$12,982	$19,891	$13,356	$13,168
Little Rock(44)	S	S	S	S	S	S	S	S	S	-	S	S	$11,047	$14,705	$11,125	$13,109
Los Angeles(74)	M	M	M	S	M	M	M	M	S	-	S	S	$68,940	$88,242	$71,862	$70,756
Louisville(27)	S	S	S	S	S	S	S	S	S	S	S	S	$14,084	$21,651	$14,084	$14,947
Memphis(45)	M	M	M	M	M	M	M	M	S	S	S	S	$17,809	$25,774	$18,318	$18,102
Miami(23)	M	M	M	M	M	M	M	M	M	-	M	M	$24,538	$33,524	$27,616	$24,555
Milwaukee(62)	S	M	-	-	S	M	M	-	-	-	-	-	$12,796	$13,089	$14,292	$14,983
Minneapolis(63)	S	S	S	S	S	S	S	S	-	-	S	-	$16,734	$19,416	$17,144	$19,020
Montgomery(28)	S	M	S	S	S	M	M	M	S	-	S	S	$41,362	$56,238	$41,750	$42,975
Nashville(29)	S	M	S	S	S	M	M	S	S	S	S	S	$16,594	$24,249	$16,656	$17,203
New Orleans(46)	M	M	M	M	M	M	M	M	S	M	S	S	$28,796	$45,048	$29,782	$29,166
New York City(0	M	M	M	M	M	M	M	M	S	M	S	S	$82,925	$120,811	$89,587	$83,184
Oakland(75)	M	M	M	M	M	M	M	M	S	-	S	S	$68,928	$99,312	$73,093	$69,516
Oklahoma City(4	M	M	M	S	M	M	M	M	S	S	S	S	$29,746	$48,078	$30,303	$30,322
Omaha(64)	M	M	M	S	M	M	M	M	S	-	S	S	$10,730	$14,821	$10,927	$10,995
Philadelphia(10)	M	M	M	M	M	M	M	M	M	M	M	M	$28,830	$39,756	$35,383	$28,830
Phoenix(76)	M	M	M	M	M	M	M	M	-	-	S	-	$27,702	$32,802	$29,262	$28,673
Pittsburgh(11)	M	M	M	M	M	M	M	M	-	-	S	-	$23,983	$28,618	$25,354	$24,809
Portland ME(12)	S	S	S	S	S	S	S	S	S	-	S	S	$11,930	$17,863	$11,937	$13,911
Portland OR(77)	S	S	S	S	S	S	S	S	S	-	S	S	$22,256	$27,938	$22,507	$24,457
Puerto Rico(30)	S	S	S	S	S	S	S	S	S	S	S	S	$6,898	$12,322	$6,898	$7,203
Raleigh(31)	S	S	S	S	S	S	S	S	S	-	S	S	$26,809	$36,647	$26,951	$28,628
Richmond(32)	M	M	M	M	M	M	M	M	-	-	S	-	$41,318	$48,533	$43,885	$42,809
Salt Lake City(78	M	M	M	M	M	M	M	M	-	-	-	-	$7,980	$9,334	$8,615	$8,274
San Antonio(48)	S	S	S	S	S	S	S	-	-	-	-	-	$27,969	$29,209	$30,243	$32,012
San Diego(67)	M	M	M	M	M	M	M	M	-	-	-	-	$75,060	$88,162	$97,479	$78,700
Seattle(79)	S	S	-	S	S	S	S	-	-	-	-	-	$20,497	$21,210	$22,537	$24,470
Shreveport(49)	S	M	M	S	S	M	M	M	S	-	S	S	$14,869	$19,110	$15,083	$15,652
Sioux Falls(65)	S	S	S	S	S	S	S	S	S	-	S	S	$3,944	$4,836	$4,011	$4,766
Springfield(13)	S	S	S	S	S	S	S	S	S	-	S	S	$13,697	$17,167	$14,016	$16,639
Spokane(80)	M	M	M	M	M	M	M	M	M	M	M	M	$8,692	$11,871	$10,134	$8,692
St. Louis(66)	S	M	M	S	M	M	M	M	S	-	S	S	$39,760	$52,350	$40,645	$40,975
Syracuse(14)	-	-	-	-	-	-	-	-	-	-	-	-	$7,148	$7,148	$9,591	$11,247
Tampa(17)	M	M	M	M	M	M	M	M	S	M	S	S	$32,601	$46,392	$34,909	$32,774
												Total	**$1,583,470**	**$2,110,492**	**$1,675,824**	**$1,663,790**

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